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FINAL REPORT

MARKET ANALYSIS FOR NEW BRUNSWICK, NOVA SCOTIA AND NEWFOUNDLAND DIMENSION STONE

by

The DPA Group Inc.
In association with:
Jacques Whitford & Associates Ltd.

Canada-New Brunswick Mineral Development Agreement
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FINAL REPORT

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1.0 INTRODUCTION

1.1 Study Objectives

This report presents an assessment of markets for dimension stone. The study was divided into two phases; the requirements of each phase are as follows:

Phase 1

- Determine and quantify markets for building stone, by type, within reasonable access of deposits in Nova Scotia, New Brunswick and Newfoundland;
- Investigate and confirm the trend to greater stone usage in the building construction industry in both Canada and the regions of the United States within reach of Atlantic Canada;
- Identify major consumer groups, major consuming centres and the amounts of stone used by type, by size, by the type of finishing and by the source of stone;
- Determine the corporate ties and the purchasing and delivery arrangements between suppliers and consumers and determine what percentage of total consumption is supplied from "captive" sources;
- Determine the extent of markets available to "independent" dimension stone producers;
- Determine the specifications for building stone by type, e.g. size, finish, thickness, colour, strength, etc. and determine any other factors that contribute to its acceptable application; and
- Determine the delivered cost of building stone by various sizes, the packaging required, the transportation modes in use.

Phase 2

- Estimate demand for dimension stone within the study area to the year 2005;
- Provide indicators and describe the methodology used to arrive at estimates and indicate confidence levels;
- Describe major changes foreseen in the building construction field which could influence stone consumption patterns;

- Determine effects of new methods of production and new processing technology on consumption and costs;
- Determine the type of promotional effort which would be most effective, e.g. a brochure with cuts of actual stone specimens, participation in trade fairs with displays and literature, etc.; and
- Address other factors which could advance further information pertinent to the identification and development of markets for building stone.

The study attempts to explore a broad range of issues related to dimension stone availability, use and market trends. Due to a lack of accurate and timely production and consumption data, extensive discussions have been held with quarry operators, construction industry representatives, mining and geological specialists in the public sector, as well as architects and developers whose design activities influence the use of dimension stone.

Research activity has been focussed on an assessment of trends in Atlantic Canada, Quebec, Ontario and the Northeastern United States. These regions represent the major potential market areas for New Brunswick, Nova Scotia and Newfoundland dimension stone.

Export markets to Europe or other offshore countries are also considered.

1.2 Definitions

Dimension stone is a broad term which relates to rock material specifically cut, shaped, or selected for use in buildings, monuments, memorials, bridges or other special architectural or engineering uses. The term also includes stone quarried in large rough blocks or slabs from which pieces of specific dimension may be cut. The most important dimension stones are marble, granite, limestone and sandstone.

In industrial terminology dimension stone is most often classified according to type and use. Classification by type divides dimension stone into categories along lines similar to the technological classification of the petrographer but the categories used are less detailed and much broader than the strictly scientific petrological system. These include: (1) marble (including cave onyx, travertine); (2) granite (including granite gneiss); (3) limestone (including dolomite, dolomitic limestone and oolitic limestone); (4) sandstone (including bluestone, brownstone, freestone and arkose); and (5) slate. All others which do not find sufficient use to warrant separate industrial classification, including schist and soapstone, are often combined to form a sixth category.

Definitions associated with classification of dimension stone according to use are largely self-explanatory. Several, however, present problems. First of all "rough building stone" consists of rock-faced blocks of differing size and shape. The term "ashlar" refers to blocks with sawed, planed or rock-faced surfaces. "Rubble stone" is stone delivered from quarries irregular in shape and size, but within fixed dimension, which can be cut and made into blocks and pieces for building walls, veneers, copings, sills, etc. Finally, "dressed stone" consists of cut, sawed or finished stone in the form of blocks of slabs shaped and sized accurately for a specified use.

In may instances one classification cuts across categories established by the other. Accordingly building stone can be of granite, limestone, marble, sandstone, slate or any of the other miscellaneous rocks suitable for use as dimension stone. Similarly, monumental stone can be either granite, marble, limestone or some other rock, and so on.

There are a number of different finishes available for the stone once it has been extracted. These are:

. **Ground Polished:** the facing of the stone is finely ground to eliminate all irregularities so that it only

shows very fine streaks hardly visible to the naked eye;

- **Bossaged:** the surface is roughly split so that the central part of the block protrudes from the arises (the edges of the block);
- **Bush Hammered:** a regular series of continuous hollows 1-3mm wide arranged in a grid pattern on the surface of the stone;
- **Tooled:** the surface is composed of fine parallel streaks 1-2mm deep between which the ridge has a rough split texture;
- **Crenelated:** a flat, rough sawn facing in which there are regular grooves 1-1.5mm deep spaced about 5mm apart with the bottom of the grooves rough sawn like the facing;
- **Flame textured:** a high temperature jet of flame is passed over the rough facing. The thermal shock splits off the surface grains (this process can only be applied to rough-grained stones);
- **Denteled:** the surface is made up of grooves 1-4mm deep between which the rough split texture remains;
- **Polished:** a single polished surface is presented as the face to reflect light without any visible streaks;
- **Honed:** fine textured even grained finish, applied with a mechanically rotated abrassive tip; and
- **Scabbed texture:** a flat facing made of up parallel streaks 3-7mm deep, 5-20mm apart generally straight, separated by small fractures where rock has split off.

The primary determinants of dimension stone demand are colour and quality. Colour range is extensive and includes blue, grey, pink, charcoal, and black. Colour preference is dependent upon a variety of factors including region, culture, application, etc.

Quality is measured by the absence of blemishes, streaks, knots, cracks, fractures, etc. Other important selection factors include texture, physical properties, availability over a long period (i.e. to ensure uniformity in a phased project) and uniformity in large quantities (i.e. similar texture, colour, etc. for large unit projects).

1.3 Market Segments

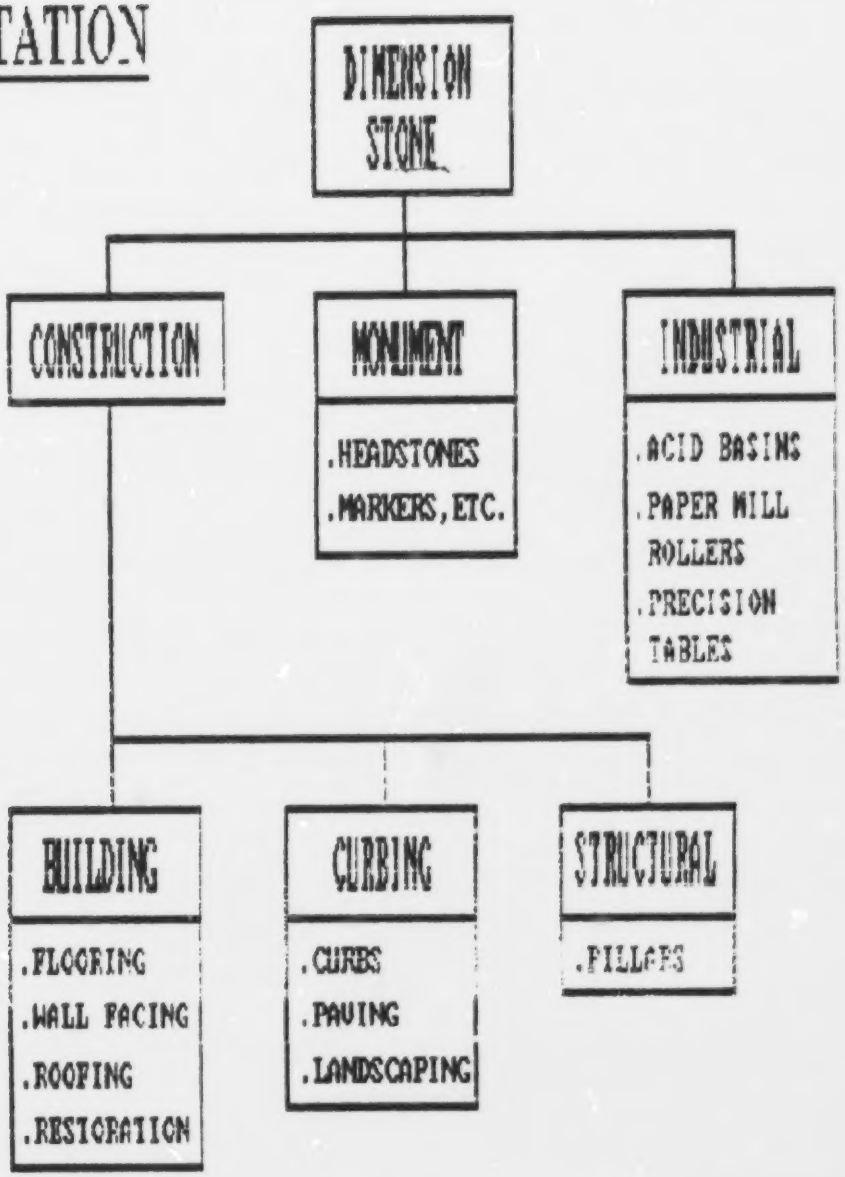
The major market segments for dimension stone are shown in Exhibit 1-1, and include the construction industry, the monumental industry, and industrial applications. The monument industry involves the production of headstones, gravemarkers, historical heritage site markers and monument bases. Industrial applications include acid basins, paper mill rollers and precision tables.

The construction industry is divided into three broad categories: building, curbing and structural. The use of stone in the building industry includes both the interior and exterior application of stone for flooring, wallfacing and roofing. In all of these applications, building stone can be either rough, dressed, rubble or veneer.

In the curbing category, granite is used primarily because of its resistance to abrasion, weathering and road salt to construct curbs (anecdotal evidence suggests that granite curbing lasts "forever" while concrete curbing usually requires replacement within 20-30 years; installed granite curbing is approximately 70% more expensive than concrete), minor ornamental applications such as in downtown revitalization projects and as a landscaping material to provide perimeter definition of planting and other public space areas. Granite paving is also used to cover slopes near bridge abutments and other areas where slope stability and erosion is a problem.

The use of stone in a purely structural application has diminished considerably since its wide-spread use at the turn of the century. Primarily due to cost and installation difficulties, structural application of stone is restricted to the use of pillars and/or columns for aesthetic purposes.

EXHIBIT 1.1:
MARKET SEGMENTATION BY PRODUCT



Slate is primarily used in roofing and although its application has declined considerably since the early 1900's, it is still used in some new construction and for repair and restoration of older buildings.

Stone is also used in the restoration/rehabilitation of heritage structures. Due to the peculiar requirements associated with this application, this market segment could be considered a category in itself.

This report focusses primarily upon the use of stone for construction but the memorial industry is also considered.

1.4 Data Constraints

Existing published data required to address study requirements is not available at the level of detail necessary. Chapter 2 provides an overview of statistics gleaned from Statistics Canada and other sources. However, these data are available only up to 1985 and are primarily aggregated by province and/or region. An analysis of recent and future trends at greater levels of detail has required extensive personal interviews with key industry participants. Interviews were also conducted in person and by telephone with architects and developers in the major metropolitan centres in Canada and the U.S. Individually these sources could not provide the quantitative information desired. This is true particularly for producers, as the stone industry is characterized by many small operators, tends to function on a word-of-mouth basis and is presently experiencing an extremely competitive situation. However, several anecdotal accounts of building stone use and job specifications has made it possible to arrive at general conclusions.

The future market demand has been based upon an indicator which relates the historic consumption by value of natural stone as a proportion of total construction activity. Future construction activity has been estimated based on a variety of sources, and then, using the indicator, future stone consumption projected.

This method should be considered to be an "order of magnitude" approach as the demand for dimension stone is, to a large degree, supply driven. Producers and fabricators can be very influential in generating demand, not only in an absolute sense, but as well in terms of specific product requirements. This factor, coupled with the fragmented and diverse nature of the industry, makes it almost impossible to predict expected future demand with a high degree of precision.

1.5 Organization of the Report

This chapter constitutes the introduction to the report. The remainder of the report is organized as follows:

Chapter 2 provides an historic overview of stone use and characteristics for Canada and the United States;

Chapter 3 presents an overview of the present supply and demand situation in the major consuming areas of Canada and the United States;

Chapter 4 presents a discussion of the industry structure, an overview of present promotional efforts and the degree of success which each affords;

Chapter 5 presents a discussion of selection criteria, specifications and prices;

Chapter 6 provides a detailed methodology and results of the forecasting procedures;

Chapter 7 presents a discussion of new developments which are likely to affect industry activity; and

Chapter 8 presents the study conclusions.

2.0 HISTORIC OVERVIEW: CANADA/UNITED STATES

This chapter presents an analysis of data available at national levels for both Canada and the United States. The information presented has been obtained primarily from Statistics Canada and U.S. Department of Interior Minerals Yearbooks.

For the sake of clarity and ease of comprehension, the data is contained in Appendix A and commentary is presented in point form format.

2.1 Historic Performance of the Canadian Industry

Shipments (Exhibit A-3)

- volume of building granite shipments has remained relatively stable over the period 1978-1982; but increased in value from $2.6M in 1982 to $5.2M in 1983;
- volume of monument granite shipments fluctuating, but value higher than for building stone for the period 1978-1982 only; $3.9M in 1982; $3.0M in 1983;
- other granite fluctuating, substantial downturn over 1980-83 period.

Imports (Exhibit A-5)

- the percent distribution of major sources of rough granite by quantity has been changing over 1982 to 1985: South Africa (60% to 48%); USA :(22% to 34%) and Italy (12% to 1%);
- major sources of dressed granite by value: Italy (69%); USA (17%) in 1985;
- quantity of rough granite fluctuates, sharp decrease 1981-1982; sharp increase 1982-1985
- value of dressed granite exhibits substantial increase over 1980-1982 and a substantial decrease during the period 1982-1985.

Exports (Exhibit A-8)

- major markets for rough stone are USA (84%), Italy (14%) and Japan (2%) by quantity in 1985;
- total quantity and value has remained relatively stable over past three years. (1982 was an exception)

Shipments by Province (Exhibit A-6)

- Quebec is major producer but share by value has decreased form 80% in 1978 to 41% in 1983, (absolute quantity has decreased 92% over the same period);
- Ontario is next largest producer with share by value increasing from 11% in 1978 to 40% in 1983; however, at the same time quantity has decreased 84% (to 1983);
- amongst the maritime provinces, New Brunswick is the largest producers with 10% of total granite shipments by value in 1983.

Value (Exhibit A-4)

- Unit values show marked fluctuation which in the absence of more detailed information is attributable to different stone types.

Total Shipments by Type (Exhibit A-7)

- total shipments decreased by 44% over the 1980-82 period; and 38% over the 1980-83 period;
- limestone is most important share of total (59% in 1980, 84% in 1983);
- shipments of granite decreased drastically over the period 1980-83.

2.2 Historic Performance in the United States

Consumption

Dimension Stone (Exhibit A-1)

- value of apparent consumption has been increasing steadily in current dollars;
- production of domestic dimension stone increased 6% between 1983-1984 after showing little change over the previous 5 years;
- distribution of dimension stone production is as follows:

	1983	1984
Granite	52%	55%
Limestone	21%	23%
Sandstone	12%	12%
Slate	4%	11%
Marble	3%	3%

- leading states in order of tonnage were: Georgia; Indiana and North Carolina;
- the average price for domestic stone increased 16% over 1982 - $83/ton to $126/ton; 1983 - $134/ton (6% increase 1982-83).

Dimension Granite (Exhibit A-2)

- value of apparent consumption has been increasing steadily since 1980;
- over the 1983-84 period, domestic production increased 6% in volume and increased 7% in value;
- leading producers in 1983 were Rock of Ages (Vermont, New Hampshire), Cold Spring Granite (various states) and H.E. Fletcher Co. (Massachusetts); 55% of total U.S. output;
- 1983 consumption by value by end use is as follows:

monumental rough stone	26%
ashlars and partially squared dressed pieces	20%

rough blocks for building and construction 18%

Production by State (Exhibit A-9)

- total US production relatively constant over the 1980-84 period;
- Georgia continued to be the leading state accounting for 28% of total production in 1984; followed by Vermont and North Carolina;
- several New England states are important producers, for example, Massachusetts, New Hampshire and Vermont accounted for 35% of total production in 1982.

Dimension Granite by Use (Exhibit A-10)

- The 1984 minerals yearbook appears to have an apparent discrepancy in the listed Dimension stone/granite quantities.

  The quantity of dressed dimension granite for monumental use (71,803 short tons) is almost twice that for dressed dimension stone (37,997 short tons) for monument use.

  This is impossible since dimension granite is only a component of the total dimension stone market. (i.e. the granite quantities by use should be equal or less than those shown for stone).
- total rough stone increases (46,060 cubic metres in 1979; 132,760 cubic metres in 1981; 145,070 cubic metres in 1983);
- total dressed stone fluctuates 78,000 cubic metres in 1979; 80,200 cubic metres in 1981; and 70,000 cubic metres in 1983.

Dimension Stone by Use (Exhibit A-11)

- monumental relatively stable;
- curbing exhibits a slight downturn over 1980-1984 (note: close to granite trends as most "stone" curbing is granite);

. construction down 1981-1984 (27%).

2.3 Summary

For the most part, the data for the 1980-1983 period indicates that U.S. shipments of dimension stone have decreased marginally while the decrease in Canadian shipments has been more substantial.

Apparent consumption in the U.S. has increased slightly in some categories while in Canada the picture is somewhat confusing but the data generally indicates a decline.

It is difficult to determine from the data whether these emerging trends are indications of a longer term phenomenon or simply represent an aberration in what has otherwise been a relatively stable industry in the five years previous to 1982-1983.

In an effort to obtain more timely data pertaining at least to construction use of dimension stone in Canada, all provincial construction associations east of Ontario (inclusive) were contacted. These organizations do not maintain information on use of materials. However, without exception these associations (including the Canadian Construction Association) indicated that the use of stone as an exterior cladding appeared to be diminishing in favour of other less expensive and easier to install materials, particularly pre-cast concrete panels and reflective curtain wall glazing.

Discussions with several architects in eastern Canada's major centres confirmed a continuing use of pre-cast concrete and reflective glazing, primarily due to the lower material and installation costs as compared to stone.

However, further fuelling the debate, the Canadian Masonry Association, and several Ontario architects were of the opinion that the use of panelized granite in construction is increasing.

Because of these contradictory opinions, a survey of architects, developers and producers across eastern North America was undertaken. The results of this survey are presented in Appendix B and discussed in Chapter 3.

3.0 PRESENT DEMAND

This chapter presents a brief synopsis of existing building stone production and consumption for Central and Eastern Canada and the United States. A detailed description of raw material supply and end-use demand in the three provinces under consideration, as well as an overview of stone application on a project basis in Canada and the U.S. is provided in Appendix B.

3.1 Architectural Trends

Architecturally the time is opportune for considerably more use of dimension stone. Commercial building design is entering what is described in the literature as "post high tech" or "post modernist style". This style involves an increasing emphasis on decoration, traditional building styles, and architectural character, which usually entails the use of natural materials such as stone. This phase is essentially a reaction to the severity of modern styles which were popular during the 1960's and 1970's.

For example, the exterior cladding of the Toronto Dominion Bank building in Halifax, designed by the WZMH Partnership in the 1970's is almost entirely reflective glazing and steel and appears out of place amongst the more traditional architectural atmosphere of Barrington Street. The same architectural firm was recently retained for a new hotel (The Prince George) recently completed in Halifax. The architectural style of this building is considerably more traditional and consists of brick cladding with coursing and banding details of different colour brick.

The post-modernist style appears to be an international trend, as for the last three to five years the bulk of architectural literature has featured the re-emergence of traditional designs and methods. In addition to its use as facing material, there is also a great deal of scope for using granite, marble, sandstone, and limestone in coursing, banding, window and door details, and other decorative trim.

Discussions with several architects indicate this trend should last for at least the next ten years, and possibly longer. Architects, designers and builders will probably continue to retain the respect for traditional approaches even if it does moderate somewhat in the future.

3.2 Demand for Building Stone

This section summarizes the results of an assessment of demand (and supply) in areas of Canada which are within reasonable transport distances of Atlantic Canada.

3.2.1 Atlantic Provinces

Available data is limited, but a review of construction activity indicates that the demand for building and dimension stone in the provinces of Nova Scotia, New Brunswick and Newfoundland has been low over the past decade. This is partially due to a lower than the national average rate of institutional and commercial construction activity, and a preference for brick cladding for schools, hospitals and office buildings. It is also due, in part, to a lack of a ready source of supply. At present there are only three commercial operators with the capability to deliver indigenous building stone to a construction site. These quarrier/fabricators are located at Shediac and Sussex in New Brunswick and Wallace in Nova Scotia; and have limited fabrication capacities. As a consequence, other cladding materials, particularly brick, reflective glazing and pre-cast concrete are more cost competitive in comparison with natural stone.

3.2.2 Rest of Canada

Demand in the rest of Canada, particularly Quebec and Ontario appears to be quite strong. Precise data is not available but discussions with many architects and developers based in central Canada indicate that there is a definite resurgence in the use of

natural stone as a cladding material for "prestige" developments and buildings. This activity is centered in the metropolitan Toronto area, although Ottawa and Montreal exhibit, on a proportionate basis, similar characteristics.

As described in Appendix B and shown in Exhibit B-1, most of the stone used in recent applications is of a wide range of colours, types and finishes; and obtained primarily from Quebec, Ontario and the U.S.

3.3 Demand in the United States

Determination of existing and recent demand in the United States was based upon a survey of major producers, discussions with Industry Associations, and architects and suppliers.

The Building Stone Institute of America (BSIA) receives many requests for data but there is little accurate documentation available. The problem stems from a regulation which limits the amount of stone an operator can quarry. However, the operator is not required to report the volumes he has mined. The dues paid to the BSIA are based on production and sales; all members have recently started to pay maximum dues; indicating sales of at least $5 Million per year. Discussions with officials in BSIA indicate that the next four years to be exceptional for stone use.

These trends are verified in part by the growth, in the United States, in the use of finished marble which is used primarily in decorative applications. The U.S. Department of Commerce (Bulletin FT135) reports that the marketplace for finished marble was 72% higher in 1984 in terms of full year imports than it was for 1983. Similarly travertine imports were 133% greater and granite imports were 93% more than the previous year's total. Further verification of this growth can be obtained by comparing the 1984 figures with 1980. In this four year period, demand for finished marble has increased 232%, travertine has grown 424% and granite shows a 675% growth.

The Marble Institute of America (MIA) indicates the industry is going through a phenomenal growth. This increase is based on several factors:

- The costs of oil has softened from the 1970's (the industry uses a great deal of oil-energy) so stone cost has decreased as well;
- The cost of many substitutes is expensive so stone is becoming more attractive price wise;
- Architects are beginning to consider stone again;
- Technology has improved so producers can more readily meet demands at a more reasonable price. Also specifications have changed and are less stringent than in the past;
- There is a noted increase in the residential market for stone (i.e. marble floors instead of ceramic etc.).

Robert Hund, in a recent report to the Marble Institute of America, states the following:

> "Within recent years architecturally specified dimensional stone has changed the look of our urban landscape. The reds, pinks, browns and blacks of granite, buff-coloured travertine and limestone and veined white marble are used for exterior cladding. For interior floors and walls, owners are asking for more and more marble panel and tiles. As a natural material, each presents a uniqueness of its own in contrast to manufactured products, and has extra values for tenant attraction and retention as well as long life and easy maintenance.
>
> Decorative architecture is experiencing a renaissance. New designs now present a variety of highly coloured and intricately carved and molded marble features.
>
> Recent new machinery developments have allowed the refinement of manufacturing techniques to the stage where stone may be cut and finished more precisely and rapidly than every before. This, translated to the market place, means quality materials available at competitive prices. The Marble Institute estimates the value of marble installed in North America in 1984 for all types of structures to be approximately three-quarter of a billion dollars. And, since vast areas of

granite are used on skyscrapers for exterior cladding its value may approach a billion and one-half dollars."

The National Building Granite Quarry Association, located in Barre, Vermont, was formed by a group of granite producing companies. The Association attempts to formulate stone specifications and influence building codes. The Association could not provide meaningful data regarding production or consumption.

An indication of the regional distribution of demand is provided by the U.S. Department of the Interior, Bureau of the Census which conducts a monthly evaluation by region for stone related private non-residential construction authorized in 17,000 permit issuing places. Over the past year, the "south" geographic division has consistently maintained a market share in excess of 40%. In July 1985, (the latest month available), the market share by region was as follows:

South	44.5%
West	24.4%
Midwest	19.3%
Northeast	11.8%

The south division consists of the following states: Delaware, District of Columbia, Florida, Georgia, Maryland, North and South Carolina, North and South Virginia, Alabama, Kentucky, Mississippi, Tennessee, Arkansas, Louisiana, Oklahoma and Texas. This region's share is almost four times as large as that of what is commonly considered to be the largest market area - the New York-Boston megalopolis.

3.4 Demand for Monument Stone and Slate

This section presents an assessment of the present and future demand for stone and for slate in the memorial industry. These products are discussed separately because of their different market parameters.

3.4.1 Slate

The commercial production of slate is very limited in Canada today. In the U.S. slate is produced in the states of Vermont, Pennsylvania and California. Germany is a know European producer.

In current construction practice slate is only rarely used as a roofing material. Slate is found on many turn of the century Toronto homes and for patching the roofs of these older Heritage buildings slates are reused from derelict abandoned structures.

Depending on the texture and thickness, used and new slates can be purchased from ACME Slate in Toronto at $3 - $8/slate installed.

Discussion with a Toronto based contractor specializing in the installation of slate roofs, indicates that in the last 18 months only one inquiry for a custom made slate roofed executive home had been received. The estimate, incidently, for installation was declined since it was considered to be too expensive.

The market for slate is considered to be quite limited and very few skilled slate roofers exist. (Due to the weight of slate a strong roof structure is required to support it). Nevertheless, a firm in Newfoundland shipped approximately 65 tons of slate in 1986 to markets in Central Canada and the U.S. Other markets off-shore are being explored and future prospects appear to be optimistic.

Supra-slate, an artificial slate product is becoming popular in Canada. This product is discussed in greater detail in Chapter 7.

3.4.2 Monument Stone

During the course of the present study, a high degree of interest regarding future markets for monument stone was expressed.

Accordingly, a telephone survey of monument dealers and suppliers in Quebec, and the Atlantic provinces was undertaken. The questionnaire, list of respondents and survey results are available at Appendix D.

With regard to market trends, 56 percent of the respondents indicated that the volume of production had increased over the last five years; in the future, 72 percent of the dealers were of the opinion that markets would improve while 28 percent were more pessimistic. The major reasons cited for expected growth were increasing urban populations and improved methods of manufacturing which were driving down costs and hence, retail prices. The main reason for a potential decline is the increasing trend to "memorial gardens" which do not permit upright headstones.

The future health of the memorial industry may depend upon its ability to change public preference for South African Black granite which currently accounts for approximately 80 percent (according to the DPA survey) of headstone sales. Sanctions against South Africa may reduce availability of black granite and thus effect sales. However, several dealers mentioned that light grey, rose and pink granites were becoming more popular, thus offsetting potential problems associated with scarcity of black granite. The imposition of sanctions may represent a market opportunity for local suppliers as suitable black granite deposits exist in New Brunswick and Nova Scotia.

3.5 Summary

Based upon the results of the survey of eastern North America industry participants, the following conclusions are offered:

- The use of dimension stone in the construction of large scale commercial and institutional projects in Canada has increased significantly over the past few years;
- The major consuming centres in Canada appear to be Toronto and Ottawa, as well, there is evidence of a beginning of interest in Montreal;

- Consumption in Atlantic Canada is limited, however several new projects and restoration projects in Halifax and Mainstreet projects in New Brunswick have involved the use of stone;

- It is difficult to generalize regarding preferred stone colour, size, properties or installation methods, however, the use of veneer granite in a variety of dimensions and thicknesses, is by far the most popular application of stone in construction;

- Consumption of building stone in the U.S. has increased dramatically; the major consuming centres are New York City, Dallas, San Francisco, Houston and New Orleans.

- The market for slate is limited.

- The future market for monument stone would appear to be cautiously optimistic.

4.0 INDUSTRY STRUCTURE

This chapter describes the structure of the stone industry and the relationships between producing and consuming groups. The North American stone industry consists of many small firms. The linkages between them tend to be somewhat convoluted and it is difficult to generalize. However, through discussions with industry participants it has been possible to determine common patterns of referral and usage.

4.1 Stone Selection Process

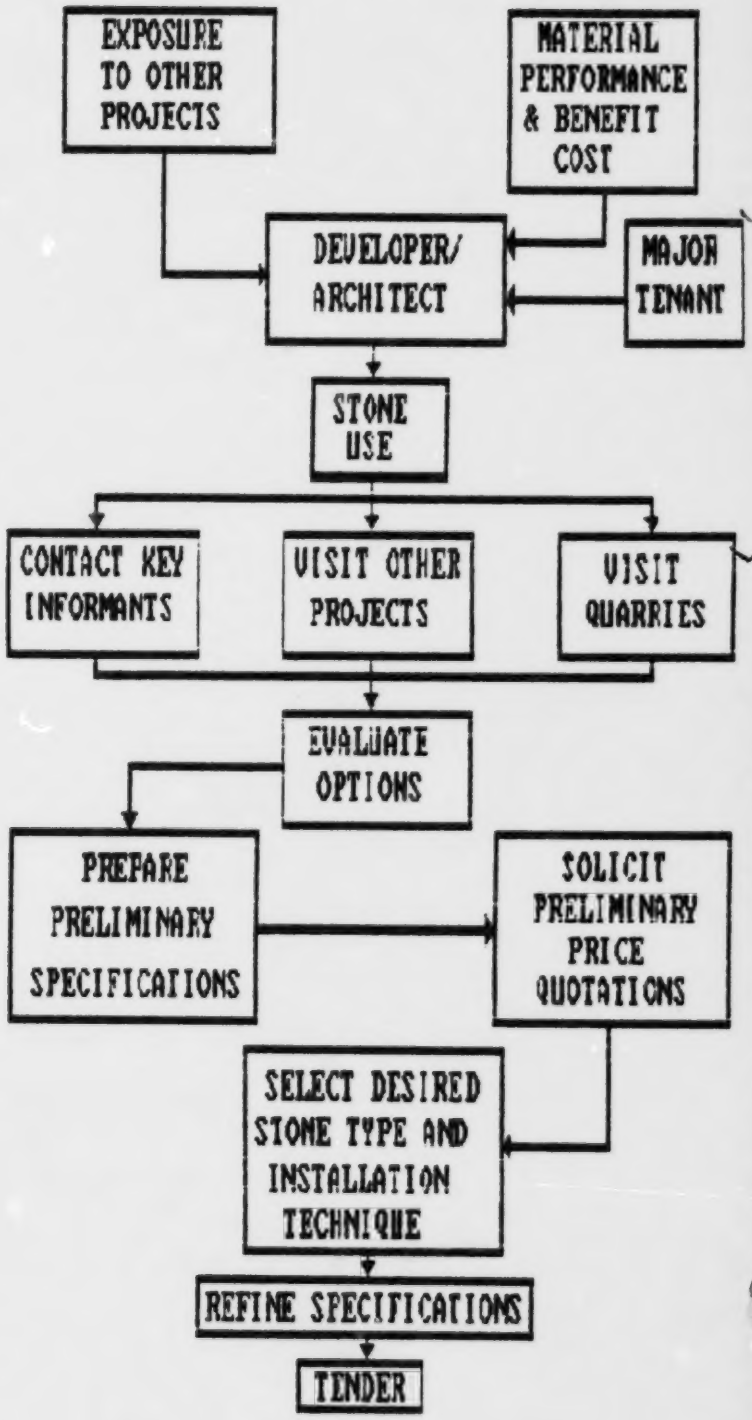
The industry structure is best described by following a typical stone selection process, (for example, as an exterior cladding material) as illustrated schematically in Exhibit 4-1 and outlined below.

An evaluation of a potential stone application is made at a relatively early state of project planning. Usually the developer and/or architect initiates the decision to use a stone cladding, based upon either a favorable exposure to stone use in other projects and/or, a detailed material performance and benefit-cost assessment. In the case of large commercial buildings a major long-term tenant may participate in the specification of a finish material for the exterior of building and the interior floor(s) which the tenant is occupying.

If stone is used, then the type of stone, fabrication, finish application and installation technique must be selected. In most cases, this research is undertaken by the project architect who in conjunction with the developer and/or engineering consultant (depending upon the scale of the project) contacts key informants: masonry contractors, stone consultants, distribution agents, and others. Often a site visit to a similar project elsewhere would be undertaken to assess the advantages and disadvantages of a particular stone application. The architect, developer or their agent may also visit the quarry from which the stone is to be extracted. (Many quarries offer free

EXHIBIT 4.1:

STONE SELECTION PROCESS



transportation to their premises as a way of promoting business.)

These site visits and discussions result in a short list of options which serve as the basis for the preparation of preliminary specifications and price quotations solicited from various fabricators and quarriers. Based primarily upon cost, but also upon availability and stone quality, the desired type of stone is selected. The specifications are then refined and the project sent to tender. In many cases, the above-described process of refinement narrows the choice of stone supplier and fabricator to a sole organization.

Where a desired colour, finish and type of stone is sought, the developer and/or architect will go to great lengths to achieve their objective. For example, for a 40 story mid-town Manhattan office tower the developer originally chose a black african granite cladding. However, when the quarry was contacted it was found that there was insufficient supply to provide for the total project (approximately 300,000 square feet). Similar granite was then found in Brazil but this source of supply also fell through. Finally, a stone agent was retained to search for the needed material and another Brazilian source was located. In the end, the stone agent was required to make nine trips to Brazil to ensure that the quarrying operation proceeded according to schedule. The rough cut stone was sawn into 1 5/8" slabs near the quarry and trucked to a port for container shipment. Final fabrication was done at a factory in Dublin, Ireland. Another Irish plant built steel trusses, 30 feet long and 6 1/2 feet high; each truss held either 6 panels of granite or three panels of granite and three windows. The trusses were then containerized and shipped to New York for final installation.

4.2 Industry Linkages

The linkages in the stone industry are fluid and complex. Broadly speaking there are three major groups which affect the stone industry. These include the development industry (the consumers), the stone industry (suppliers and fabricators), and

an interface group which consists of stone consultants, masonry contractors and agents.

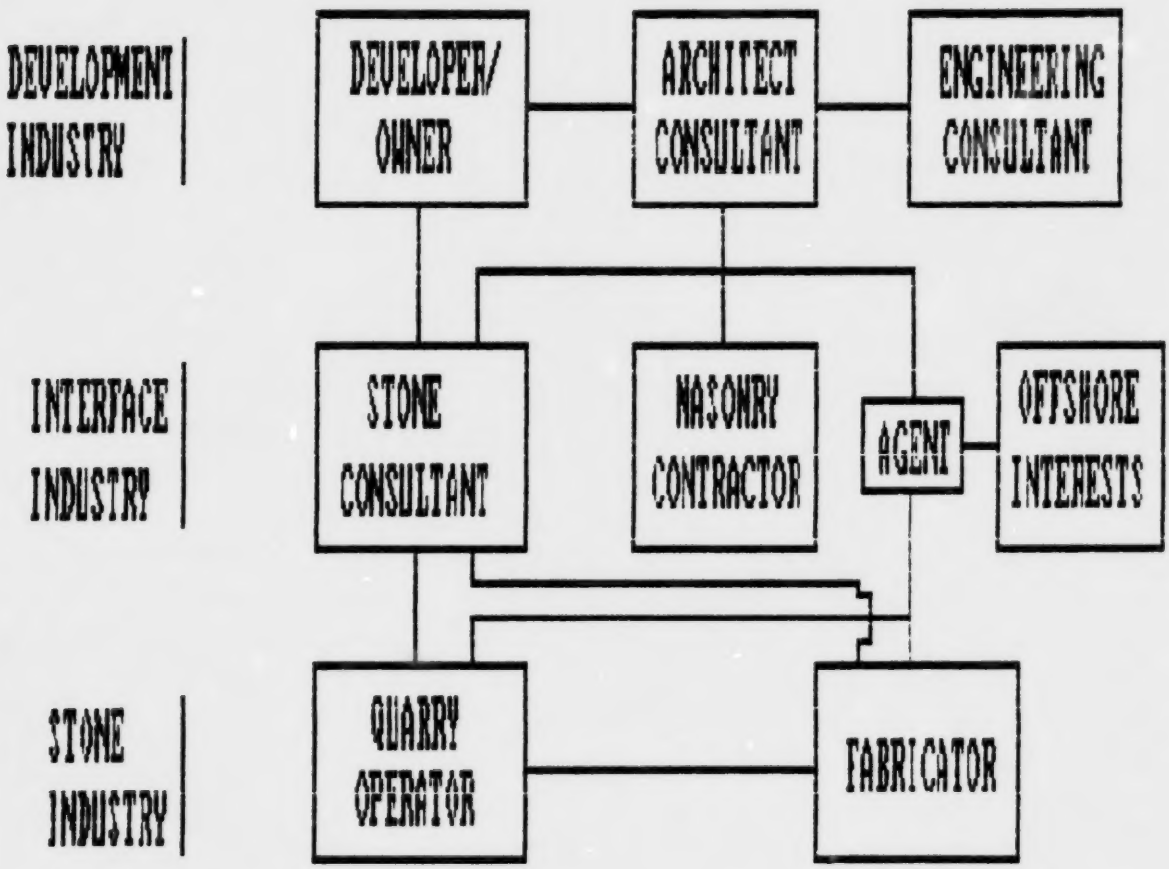
The linkages between these three major groups are illustrated in Exhibit 4-2 (the relationships have been simplified for presentation clarity.) The development industry consists of the developer/owner, the architectural consultant and the engineering consultant. Within this group the decision to consider a stone application can come from any one of these three organization, although generally the developer and/or architect would make the decision; the engineering consultant would be primarily retained to evaluate fastening systems and application techniques.

Within the stone group the major participants consist of quarry operators and fabricators. More often than not, these are one and the same, in that most fabricators, in order to guarantee a source of supply, have their own quarries. This is particularly true of the granite veneer fabricators, but not so true of the restoration and specialty stone shapers. . For example, Scott Stone in Toronto does not have its own quarry but rather fabricates whatever stone has been deemed suitable for a particular application. This stone is usually imported from out of province.

The stone industry exhibits extensive vertical and horizontal integration both formal and informal. In many cases, developers, architects, and engineering consultants have developed strong working relationships and contractual arrangements with individual masonry contractors, quarry operators and fabricators.

This linkage is maintained by a word of mouth referral process and strengthened as reputations are built through successful experience: suppliers in meeting deadlines and quality/quantity specification; fabricators in cutting and finishing intricate shapes; and contractors in developing innovative and cost-effective installation methods.

EXHIBIT 4.2: INDUSTRY LINKAGE



While most industry participants have a clearly defined role, the agent and stone consultant undertake responsibilities and activities which overlap many of the other participants' functions. These activities include:

- engineering and design of cladding systems;
- consultation on stone selection, fabrication, assembly and erection technology;
- laboratory testing;
- representing operators and fabricators.

In many cases, the supplier, the consultant, and agent are one and the same. On the other hand, independent stone consultants do exist, offering their services primarily to architects and developers. For example, Livathinos & Watson Inc. of Dallas specializes in producing shop drawings of exterior facades, for architectural firms.

Granicor, one of Quebec's largest factories capable of producing granite veneer serves as an example of the degree of integration prevalent in the industry. This fabricating plant is a joint venture of the Robitaille family of Alma, Quebec, along with Campolonghi, a large Italian fabricator and Olympia-York, a Toronto-based developer. The interests of the Robitaille family includes some 10 quarries as well as other fabricating facilities that are either wholly owned or partnerships. These include National Granite, a fabricator which specializes in the production of thicker veneer materials for walls and floors, and Columbia Granite, a quarrying company which ships about 50% of its blocks to Granicor. The Robitaille organization also has a working relationship with Dumas and Voyer in Riviére à Pierre (one of the largest quarries in Canada), as well as a partnership in RocSolide, with an Italian granite company. RocSolide ships, on an almost exclusive bases, granite blocks to Italy. Both Granicor and Campolonghi are represented in the U.S. by Stone Tech, Inc. of New York.

In North America, most transactions involving either product or consultation are direct in that the use of middlemen and/or brokers is very rare. This is largely due to the "family" nature of doing business and the bonds which have developed through habit over the course of time. Most quarries/fabricators either have their own sales force or do not need one because they are well known or offer a specialty service which few can provide.

On the other hand, offshore quarries and fabricators usually employ an agent/broker to represent them in the U.S./Canada, or they participate directly in the North American industry through joint venture or partnership arrangements with local firms. As an example of the latter, Savema s.p.a. of Pietrasanta, Italy has recently formed a joint venture with Castellucci and Sons, Inc. of Providence, Rhode Island to build a new $6 Million (U.S.) fabricating plant, for thin cut granite, near Providence.

4.3 Establishments

A listing of major Canadian establishments appears in Appendix E. The number of establishments operating in Atlantic Canada is very small. The major province of activity is, without doubt, Quebec where the Granite Producers' Association of Quebec is the major dominant lobbying group. There is no equivalent association in any of the other provinces in Canada, although many quarry operators and fabricators belong to the Masonry Contractors Association of Canada.

In the United States, there are 224 U.S. based fabricators and quarriers listed in the publication, "Who's Who in the Stone Business", which is published by the Building Stone Institute. The Building Stone Institute as well as the Marble Institute of America, serve as the major umbrella organizations for the stone industry in the U.S. Discussions with the Building Stone Institute indicate that their list represents only organizations who are members of the Institute; the degree of representation of the total industry is not known. However, an official with the

Institute estimates that there are "several hundred" more organizations operating in the U.S. who are not listed.

4.4 Promotion

This section presents a discussion of promotional mechanisms and marketing strategies employed by the stone industry.

The approach to developing the information contained in this chapter has been largely based upon discussions with individual operators and producers as well as end-use clients.

Traditional Methods

The traditional promotional methods are largely self-explanatory and are as follows:

- Advertisements in trade journals, such as Stone World, Building Stone Magazine and Dimension Stone;
- Participation in trade fairs;
- Membership in various representative organizations, such as the Building Stone Institute of America, the Marble Institute of America, the Granite Producers' Association of Quebec and the Canadian Masonry Association;
- Production of brochures which highlight products and/or services available;
- Production of sample products for distribution to potential clients;
- Affiliations with wholesalers and distribution agents; and
- Affiliation with developer-oriented and architectural organizations.

While each of the above methods has advantages and disadvantages, it is difficult to generalize with respect to the most popular or the most successful methods. The promotional method is dependent

upon the type of product, the most suitable application, and the geographic extent of the market area.

In large measure, the stone industry operates on a word of mouth basis. The industry is characterized by many small operators each with a specific and somewhat unique product. Over the years, reputations have been built through demonstrated capabilities and the physical durability of various techniques and materials.

Consequently, the most effective marketing tool is a successful project which provides a source of inspiration, not only in terms of stone type, colour, texture, etc., but as well in terms of the structural and facing technique used in the cladding of the building.

The experience of the Granite Producers Association of Quebec makes for a strong argument that the most effective promotion results from a cohesive organization capable of mounting a comprehensive lobbying effort geared towards increasing the use of stone as a building material, in general.

Most industry participants are quite small and simply cannot afford to employ designated sales representatives. Therefore marketing, in the traditional sense, is conducted by a distribution agent. However, the agent represents more than one stone producer and is thus, more interested in satisfying his clients needs to the fullest extent possible rather than promoting a specific product or supplier.

Emerging Methods

This section presents new stone promotion and marketing methods.

A stone fabrication and installation firm, Don Lepore and Sons Co. Inc. of Philadelphia has developed a unique way to promote the use of stone by means of a showroom display which includes over 185 domestic and imported granite and marble samples from 13

major quarries and suppliers. The showroom has attracted architects and designers from a wide geographical area. The stone samples provide a wide range of colours and finishes; samples may be borrowed, if necessary, and include information on quarriers, suppliers and nearest representatives. Don Lepore and Sons is neither a supplier or quarrier and no fee is charged or commission paid. No sales are made at the showroom and thus it is impossible to ascertain the degree of success possible with this marketing method.

Another U.S. firm, Connecticut Stone Supplies, employs a similar strategy using a showroom with a home-like setting to display its floor and wall surfacing stone products and a line of marble furniture.

Conclusions

Discussions with industry participants indicate that not one specific promotional method is superior to another. Rather, marketing efforts are secondary to the establishment of a sound reputation for quality products and timely delivery.

The major avenue for potential improved market penetration is for the stone industry as a whole to lobby more effectively for increased use of stone in construction and architectural applications. The fragmented nature of the industry, constrains the potential for collective marketing.

Since the establishment of the Association of Granite Producers of Quebec, the value of stone activity in Quebec has increased significantly. The Director of the Association believes this success is largely attributable to a collective effort to promote the use of stone in general, rather than individual producers attempting to sell their specific product.

5.0 SPECIFICATIONS AND PRICES

5.1 Introduction

This chapter presents an overview of dimension stone selection criteria, both in new construction applications and for restoration. Detailed architectural specifications related to individual projects have been difficult to obtain. However, job specifications for the Metropolitan Toronto Police Headquarters have been made available from Shore Tilbe Henschel Irwin Peters and Mathers and Haldenby Associated Architects. These are available under separate cover along with stone-related specifications from the American Society for Testing and Materials. A discussion of prices by stone type and transportation costs is also included in this chapter.

5.2 Dimension Stone Selection Criteria

The selection of a stone material and finish for a large project especially for exteriors, involves several steps designed to ensure the material satisfies stringent technical requirements. This process begins with the architect having some idea of the finished result based on exposure to previous projects. The aesthetic and colour requirements of the project can be determining factors. The architect obtains samples of various potential materials with data on colour, approximate costs, total quantity available and source. The actual evaluation and selection process involves three phases:

- selection;
- properties and performance; and
- fabrication and installation.

The important elements of each phase are discussed in point form below.

Selection

- Samples, colour range and texture;
- Costs;
- Available quarries;
- Feasibility;
- Mock-up;
- Quarry visit.

Properties and Performance

Physical properties and performance aspects include the following:

- Chemical and physical composition production tolerances, shape, dimensions, weight;
- Anchor design, pull-out, etc.;
- General appearance: evenness, physical smoothness and flatness of surface;
- Appearance of visible face, texture, grain, colour;
- Availability of different finishes;
- Thermal properties;
- Structural serviceability;
- Fire safety;
- Thermal and acoustic properties;
- Durability;

- Practability: transportation, storage on site, handling during installation, field tolerances, connections;

- Code acceptability;

- Economic: installed costs and maintenance.

Fabrication and Installation

Selection of the stone may also be dependent upon various fabrication and erection methods used by local masonry contractors. The securement of facing stone usually includes either a prefabricated unit or field applied facings. For example, for the Provincial Court House in Ottawa, marble was cut by Arriscraft Corporation (Cambridge, Ontario) into 35 mm x 1 metre x 1/2 metre panels, which were in turn supplied to E & M Precast (Toronto), for installation on a metal framework which included pre-cast concrete banding. The final fabricated panel, weighing approximately 15 tons, was shipped to Ottawa by truck for final installation.

5.3 Restoration

Restoration is required to rehabilitate older buildings which have suffered exterior stone degradation due to the ravages of time, weather and acid rain.

The objectives of restoration activity are to maintain historical accuracy, provide long term solutions and protect the safety of individuals within proximity of the structure from falling stone. The overall objective is to create a sound building which is as historically accurate as possible and which is protected from future deterioration.

There are three approaches to the repair of a stone structure:

- replacement;

- cutback and face and insert a thinner stone over the top;

- retool the face (remove approximately a quarter of an inch and re-flute the face) if the original stone is deep enough.

The knowledge of the actual nature of the stone is crucial to the selection of rehabilitation methods.

There are several examples of on-going restoration projects in Halifax: Provincial House, the Dominion Building and Government House.

Province House was originally completed in 1819 from Wallace Sandstone extracted from the Batte Quarry on the Wallace River in Cumberland County. The Batte Quarry closed in the early 1900's. The replacement stone is to come from another quarry, which ceased operation about 15 years ago but is to be reopened, in Wallace.

British sandstone consultants who completed the cleaning of Province House were also awarded the restoration project for the Dominion Building. A stone by stone inventory of the Dominion Building determined that approximately half of the stone must be replaced. This process will involve quarrying (it is intended to use the original source at Pictou), finishing and installation. To undertake this work, six master stone masons will be brought from england in early 1986 and six local apprentices will be offered training over a three to four year period. The Dominion building is heavily ornamented (cherries, lion's heads, etc.), hence the long time frame. At the completion of the project it is hoped that Nova Scotia will have a number of trained young stone masons available to undertake other restoration projects.

5.4 New Construction Specifications

This section discusses recent trends in the development of modern specifications for dimension stone use. Because the application of dimension stone in modern construction has changed dramatically (and continues to evolve) from past trends, in many instances specifications are simply not available and completion of a satisfactory job requires substantial interaction and cooperations between the architect and the masonry contractor.

A recent example of the latter situation is Number One Government Place in Halifax (Prince and Granville Street). Designed by a local architectural firm, Lydon Lynch, the building is faced with polished granite slabs. The specification used for the exterior cladding called for precast concrete (with the understanding that granite would be applied).

The construction method used was to mount a number of granite slabs onto large metal frames similar to those used in curtain wall technique. The frames were approximately 10 feet by 10 feet. The slabs were mechanically fastened to the frame (allowing space for windows, etc.) and then the entire unit was mounted on the side of the building. This procedure was relatively expensive in comparison to standard curtain walls, but the developer felt that the final product would be worth the extra cost. The granite used was quarried in Norway, sent to Spain for finishing and then sent to Dartmouth where the slabs were affixed to the metal frames, by an Ontario contractor.

The acquisition of detailed current specifications has been a difficult aspect of the study. However, some examples have been made available by the Chief Specification Writer, John Lyons of a joint venture Toronto Architectural firm, Shore Tilbe Henschel Irwin Peters Mathers and Haldenby Associated Architects. These are available under separate cover.

A perusal of these specifications indicates that despite the substantial amount of detail regarding the exterior cladding

system, relatively little is said about the actual stone other than it is to be "Brazilian Red Corall supplied by Granitex" and "polished and flamed to match samples in Architects's office", (see part 2.02:80), and 32 mm thick for exterior and 22mm thick for interior applications (see section 04420, part 2.07.1).

Most other projects, (see Appendix B) involve the use of granite veneer in a variety of dimensions, but generally sized at approximately 1,000mm x 500mm x 35mm. Differences in the thickness and surface area are possible but because natural stone has a tendency to "bow" if cut too thin, as the area increases the thickness must be correspondingly increased as well. For example, it is possible to cut panels 1,000mm x 2,000mm at a thickness of approximately 64mm. There appear to be more exceptions than rules and the panel dimensions to which a particular stone may be cut depends upon:

- natural properties;
- methods of extraction at quarry;
- installation/erection method;
- fabricating equipment; and
- climate at building site.

The most prevalent specification method for a preferred stone is to physically visit the quarry and agree upon the composition properties by evaluating available samples. The accepted sample is then distributed to the major project participants as a control unit against which all material is verified. Typically, control samples will be available at the following locations:

- project site office;
- developer;
- architect;
- masonry contractor;
- quarry operator; and
- fabricator.

Detailed physical property specifications have been developed by the American Society for Testing and Materials (ASTM). These parameters are listed in Exhibit 5-1; supporting documentation is available from the Society.

EXHIBIT 5-1: ASTM SPECIFICATIONS FOR BUILDING STONE

C97-83	Absorption and bulk specific gravity
C99-52	Modulus of rupture
C119-83C	Standard definitions of terms
C120-52	Flexure testing of slate
C121-48	Water Absorption of slate
C131-55	Abrasion resistance by Los Angeles Test
C170-50	Compressive Strength
C217-58	Weather resistance of natural slate
C218-48T	Combined effort of temperature cycles and wash salt solutions on natural building stones
C241-51	Abrasion resistance of stone subjected to foot traffic
C406-84	Roofing slate
C503-79	Exterior Marble
C543-81	Slate Blackboards
C568-79	Dimension limestone
C615-80	Granite Building Stone
C616-80	Building Sandstone
C629-8	Structural Slate

Although seldom actually specified, the long-term availability of a particular stone is an important factor due to the possibility of future additions or repair work which must match the original structure. A related factor is that many architects prefer established building stones with which they are familiar. These considerations give long established quarries an advantage over new or untried stone despite any other specifications.

5.5 Prices

Current pricing practices have been difficult to obtain. With few exceptions, architects and producers were reluctant to provide precise costing information. However, "ball park" estimates have been obtained from installation contractors.

Atlantic Canada

Prices within Atlantic Canada are relatively consistent. Imported granite is the primary stone used and is destined mainly for the memorial industry.

The approximate prices for imported rough granite, FOB an Atlantic dealer, are as follows:

Stone Source	$/Cu.Ft.
Domestic (New Brunswick)	5-10
Quebec/Ontario	10-20
Offshore (South Africa, India, etc.)	40-60
United States	15-25

These prices could be considered to be high as the memorial industry demands stone of high quality (aesthetic properties of the stone are more important than, say, for veneer cladding).

Detailed prices specific to the construction industry in Atlantic Canada could not be obtained. However, the cladding for a building in Halifax was accomplished with granite quarried in Norway, finished in Spain and then assembled in Canada. This situation is not unusual. In many other projects, rough stone is shipped from Scandinavia, Africa or India, etc. to fabricators in Spain and primarily, Italy; the finished product is then shipped to the construction site in North America. (See stone type by project list in Appendix B). Because of the total distances involved, the incremental transport difference between, for example, Halifax and Toronto does not affect the total installed

price significantly. It is probable that prices in Atlantic Canada do not differ appreciably from Central Canada.

Rest of Canada

Prices for this region were also difficult to obtain. Prices for installed granite veneer were estimated by one of the largest stone contractors in Canada (G & A Masonry, Kitchener) to range from $25-50 per square foot; depending upon the source and nature of the raw material, and the location of the fabricator. An average cost for offshore stone fabricated in Italy was in the order of $35 per square foot, of which $15 per square foot (for a 7/8 inch thick veneer) would represent the material cost (stone and fabricating) with the remainder accounted for by installation and shipping. Several producers also offered the following estimates:

- quarry costs are approximately $60/ton, based upon a 20,000 ton per annum extraction rate;
- depending upon block yield and dimension/ shape specifications, finished veneer marble or granite pavers vary from approximately $8 to $20 per square foot, not including installation costs;
- the cost of rough limestone block from Indiana is approximately $11 (U.S.) per cubic foot, FOB Toronto;
- finished limestone flat work (4" thickness) was estimated at roughly $20 (Cdn.) per cubic foot, not including installation;
- finished shaped restoration work in limestone varies from $90 to $200 (Cdn.) per cubic foot, not including installation;
- the cost of rough block sandstone varies from $2-6 per cubic foot, at the quarry, depending upon ease of access; the finished product is generally $18-20 per cubic foot.

United States

Because of the wide variety of finishes and different rock types, not to mention colour and texture variations within each type, the price spread for dimension stone is very large in the United States. This situation is compounded by the fluctuating value of the U.S. dollar. For a major building completed in 1984, the granite veneer was quarried in Tennessee, finished in Italy and supplied to the installer at approximately $10 (U.S.) per square foot; the installation process cost an additional $14 (U.S.) per square foot.

5.6 Transportation

Almost all overland transportation of stone is by truck. Rough blocks as large as 35 tons are carted by flatbed from the quarry to the fabrication plant. The finished product is packaged and containerized/crated for shipment. Generally, the thinner the panel, the more care is taken in packaging.

Overland transportation costs vary considerably. Particularly since the advent of deregulation in the United States, the charges are subject to negotiation. Because of the "back-haul" situation, it would be less expensive to ship to the Northeastern States from Canada, than vice versa. Several examples are offered to illustrate the situation.

For a Boston to New York trip hauling 18 tons costs approximately $70.00.

In Nova Scotia trucking charges amount to approximately $.15 per tonne-mile.

The transport charge from Bedford, Indiana to Toronto, for limestone, is approximately $5 per cubic foot.

Approximate shipping prices from Ontario to Eastern Canada are $4000 for a 40 ton load; shipments to the northeastern U.S. cost approximately $40/$50 per ton.

A major contractor estimated that approixmately 35 percent (and greater) of the total installed cost is accounted for by transport costs.

6.0 MARKET FORECASTS

6.1 Introduction

This chapter presents forecasts of expected demand for dimension stone. Historic economic and construction trends were assessed from Statistics Canada and U.S. Department of Commerce sources and from relevant trade association publications. An overview of the expected performance of the Canadian and American construction sectors, which is germane to the future potential of the stone industry, is provided at Appendix C.

6.2 Stone Consumption Forecast

6.2.1 Canada

The Canadian Construction Association (CCA) produces forecasts of investment for a variety of construction categories. These forecasts are confidential. However, from this information, DPA has extracted the following growth rates for the most likely consumers of natural stone.

EXHIBIT 6-1: VALUE OF CONSTRUCTION FORECASTS

Construction Category	Average Annual % Change*		
	1986-1990	1991-1995	1996-2005
Government	2.04	2.49	2.18
Commercial	4.70	3.98	4.51
Institution	1.62	1.60	1.32

Source: Canadian Construction Association
* based upon constant dollars

A forecast of dimension stone use, has been based upon these construction category growth rates and a ratio (developed for the purposes of this study) of apparent consumption of stone by value to commercial and institutional construction value. This ratio

is an expression of the value of domestic stone volume used per annum in proportion to the combined value of annual commercial and institutional construction activity. This has been calculated as shown in Exhibit 6-2 and results in an average Apparent Consumption/IC Value ratio of .0574. In spite of the fact that this ratio has been developed on the basis of Statistics Canada data, it should be viewed with considerable caution as it is suspected that a substantial amount of stone industry activity is unreported.

A further consideration related to the development of this ratio is the fact that "flow through" of imports and exports is to be expected. This phenomena refers to activity such as the export of rough blocks to another country for fabrication, and the subsequent import of the finished product. It may also occur that rough blocks are imported to Canada, finished in Canada and then exported. It is difficult to estimate the magnitude of these activities and it is unlikely that there is a net "zero sum" in the transactions.

Because of the lack of precision of the data and the above-mentioned factors, the approach described should be considered as providing " order of magnitude" estimates of likely future domestic consumption.

The results of the forecast are shown in Exhibit 6-3. The value of apparent domestic consumption increases from $5.1 million in 1986 to $5.9 million in 1990, and $6.9 million in 1995.

These results should be interpreted with caution as they are based upon an "unofficial" indicator which represents an average ratio of apparent consumption value to construction value determined from five years of data. Discussions with key informants in the stone industry indicate that the use of stone in construction is somewhat of a "fad". Thus, it is difficult to predict future trends.

EXHIBIT 6-2: ESTIMATION OF APPARENT CONSUMPTION/ CONSTRUCTION VALUE RATIO, CANADA ($000, $ CURRENT)

	YEAR				
Category	1980	1981	1982	1983	1984
Total Stone Imports[1]	4,455	8,682	18,974	13,746	18,820
Total Stone Shipments[2]	7,115*	9,314*	9,695	12,078	13,610*
Total Stone Exports[3]	6,022*	11,581	20,119	24,864	30,762
Apparent Consumption	5,548	6,415	8,550	960	1,668
Commercial Construction Value[4] (C)	5,178,499	6,145,477	6,142,299	5,474,696	5,943,324
Institutional Construction Value[4] (I)	1,834,262	2,129,275	2,506,995	2,504,666	2,497,816
Total IC Value	7,012,761	8,274,752	8,649,294	7,979,362	8,441,140
Apparent Consumption/ IC Value ratio (x 100)	.079	.078	.099	.012	.019

* = Linear regression estimate.

Notes:
1 = Statistics Canada 65-207 and 65-203
2 = Statistics Canada 26-225
3 = Statistics Canada 65-202
4 = Statistics Canada 64-201

Export Opportunities

There are several other factors which will influence demand for Canadian dimension stone. These include:

- exchange rate of Canadian dollar;
- free trade developments;
- price of oil;
- architectural trends.

At the present time, the low value of the Canadian dollar with respect to the U.S. dollar makes for very favorable export conditions to the U.S. market. To a large degree the exchange rate will offset transportation costs, particularly from Atlantic Canada to the Northeastern states. The future value of the dollar and the future of free trade developments with the United States could have significant effects on exports of dimension stone.

The price of oil, at the time of writing, has been fluctuating at approximately $15 US per barrel. This situation will likely prevail until the end of the decade according to many analysts. Low oil prices are very favorable to the stone industry, as significant amounts of oil-energy are consumed in all phases of extraction, transportation, fabrication and installation. Consequently, it is possible that stone could become more cost-competitive with respect to other building materials. This fact coupled with stone's increasing desirability as a surfacing material will improve demand.

Current architectural trends point to increased use of stone in large projects as discussed in Chapter 3 and Appendix B. The increasing success and expanding reputations of Canadian architects could also favour increased use of Canadian stone.

Over the past years, Canadian architects have won large design contracts around the world:

- $65 Million Phoenix City Hall by Barton Meyers Associates, Toronto;
- $1 Billion Los Angeles California Centre, by Arthur Erikson, Vancouver;
- Maseru Airport, Lesotho, by Naiche, Owen, Rowland and Roy, Toronto;
- Elf-Aquitaine Headquarters, Paris, by Webb, Zarafa, Menkes;
- $700 Million Yerbabuena Gardens, San Fransisco, by Webb, Zarafa, Menkes;
- Canadian Embassy, Mexico City, by Etienne Gaboury, Winnipeg;
- Opéra de la Bastille, Paris, by Carlos Ott, Toronto;
- Buffalo Mainstreet Revitalization and Hong Kong Science Centre, by Moriyama & Teschima, Toronto;
- Quita Hotel, Pakistan, by Arcop, Toronto; and

These architects could recommend the use of Canadian dimension stone in their projects if competitive prices in comparison with traditional offshore sources of stone could be assured for canadian stone at the foreign construction site.

An analysis of the data in Appendix A shows that the value of exports in 1984 was two and one half times the value in 1981, in current dollars. Even with adjustments to account for inflation, this represents a substantial increase in activity. Over 1983 and 1984 imports have increased substantially while total shipments have increased marginally. This could be interpreted to imply that stone is being imported for fabrication in Canadian plants and then exported.

6.2.2 United States

The methodology used to forecast stone consumption in the U.S. is similar to that used for the Canadian forecasts. A ratio of apparent stone consumption by value, to the value of non-residential construction has been developed as is shown below. The Canadian and U.S. ratios cannot be compared due to different definitions of construction categories.

EXHIBIT 6-4: ESTIMATION OF APPARENT CONSUMPTION/CONSTRUCTION VALUE RATIO, UNITED STATES ($000, $current)

	YEAR		
Category	1981	1982	1983
Apparent[1] Consumption	262,706	296,309	323,576
Non-Residential Buildings * [2]	60,818,000	65,234,000	60,309,000
Ratio	.00432	.00455	.00537

Source: 1 = Bureau of Mines, Minerals Yearbook, 1981, 1983; United States Bureau of the Interior
2 = Department of Commerce, Bureau of Economic Analysis, Survey of Current Business
* = Excludes farms and public utilities

The average annual ratio of the value of apparent consumption to the value of non-residential buildings is .00475.

Based upon this ratio, a forecast of stone consumption was estimated in proportion to forecasts for the value of non-residential building which were made on the basis of historic trends over the past five years (the latest information available).

Two different construction cost indices were used to convert to constant dollars: the Boeckh Index for apartments, hotels and office buildings; and the U.S. Department of Commerce Composite Index. The results are shown at Exhibit 6-5.

EXHIBIT 6-5: HISTORIC CONSTRUCTION VALUE, U.S. TOTAL NON-RESIDENTIAL BUILDINGS ($millions)

	1981	1982	1983	1984	1985*
Total non-residential buildings ($ current)	60,818	65,134	60,309	74,147	87,950
Boeckh Index ($1977, constant)	44,263	43,163	37,787	44,452	51,493
(Office buildings)	(137.4)	(150.9)	(159.6)	(166.8)	(170.8)
Composite Index ($1977, constant)	40,038	42,267	38,340	45,294	52,103
	(151.9)	(154.1)	(157.3)	(163.7)	(168.8)

* = Preliminary
Source: Department of Commerce, Bureau of Economic Analysis for both indices, 1977 = 100

The Boeckh Index is more appropriate for non-residential construction value, and indicates a sharp rise of 36% over the last three years after a decline of 15% over the period 1981-1983. It should be noted that 1982 and 1983 were recessionary years in the U.S. The Composite Index indicates a steady rise over the five year period, if the 1983 value is excluded. The 1981-1985 period increase as a whole, yields an average annual percent change of 4.08 using the Broeckh Index and 7.53 using the Composite Index. In the light of prevailing occupancy rates and some analysts' projections that non-residential building activity will slow down over the next few years, an average annual change of 4% in real terms was applied to a 1985 base year value of $87,950 million, for the 1985 - 1990 period. Thereafter, an annual percent charge of 7% was used.

The results of stone consumption forecast estimates are provided at Exhibit 6-6, and show an increase in the value of apparent consumption from $418 million in 1986 to $489 million in 1990, and $595 million in 1995. The comments regarding the Canadian forecast apply equally to the U.S. forecast.

6.3 Conclusions

Provided the proportionate share of stone value with respect to construction value remains relatively constant, domestic consumption of stone in Canada and the U.S. shows good growth. There are also substantial export and fabrication opportunities for the Canadian industry. The forecasts indicate that substantial business volume in stone activity is to be expected in the future.

The forecasts are based upon a stable Apparent Consumption/IC Value Ratio and do not reflect a potential increased market penetration by natural stone in the construction industry. This phenomenon is highly possible because of the strong trend towards the post-modern architectural style and the increasing use of natural materials. In this regard, stone is considered by many architects to be the material of choice.

To provide an indication of the impact of a small change in the consumption value ratio, one need only to consider how the Canadian forecasts would be affected if apparent consumption levels similar to the 1980 and 1982 levels could be attained in the future. These levels would result in Apparent Consumption/IC Value ratios of .079% and .112% respectively. (See Exhibit 6-2).

Thus, for example, in 1995 the stone consumption forecast at the 1980 level would be $9.6 million and $13.6 million for the 1982 level. These levels are 33% and 89% respectively higher than the 1995 level forecast which was based upon the average annual Apparent Consumption/IC Value Ratio.

7.0 IMPACT OF FUTURE DEVELOPMENTS IN CONSTRUCTION INDUSTRY PRACTICE AND STONE PRODUCTION TECHNOLOGY

7.1 Introduction

This chapter presents a discussion of recent past changes and expected future changes in the construction industry which may affect stone consumption volume and patterns. There are three main topics to be considered:

- trends in office building occupancy and operation;
- new construction techniques; and
- stone substitute materials.

The chapter concludes with a discussion regarding new technological developments in the stone industry. Within the past 10 years these developments have been many and varied. The scope of change is large and is taking place too rapidly to discuss in detail in this report. Instead, the focus is on the use of computers which, as in other industries, is already creating substantial beneficial impacts, particularly in the fabrication process.

7.2 Commercial Office Building Development and Occupancy Trends

There are two major factors (in addition to vacancy and absorption rates which are discussed in Appendix C) which will affect future office building construction. These factors are: the comparative value of alternative investments (i.e. stocks and bonds versus residential and commercial real estate); and the function of the buildings themselves in terms of accommodating corporate requirements.

The 1985 Royal-Lepage Market Survey of Canadian Real Estate states that real estate has consistently provided investors with very attractive long term returns. The report states that "while stocks and bonds sometimes outperform real estate in the short

term, no other investment medium insures the consistent returns of real estate over longer periods."

The report also states: "Today there appears to be a growing consensus among many asset managers that 15 to 20% of the modern portfolio belongs in real estate. U.S. pension funds now have, an average, 5% of total assets in real estate and according to some strategists this will rise to 30% or higher."

In today's cost competitive business world, profit margins are low and money managers, constantly struggling to improve the bottom line, are beginning to view capital assets as an integral part of overall cash flow. Real estate is bought and sold on the basis of serving financial interests, rather than functional interests such as the acquisition or sale of accommodation space. In addition, firms who lease space are moving more often in the search for more favorable rents. These developments have contributed to rising absorption rates and increased office space construction activity.

As well, there are a number of other developments which are expected to sustain this activity at relatively healthy levels in the future. The creation of financial "supermarkets" - the integration of the financial services industry, resulting in a smaller number of larger firms with a very wide range of services will affect overall real estate activity as corporations seek to consolidate space. The level of real interest rates (i.e. nominal rate of interest less the rate of inflation) will probably remain high. In many cases over-supply is stimulating activity, and landlords, in order to fill their buildings, are developing very attractive deals characterized by generous tenant inducements. In the early part of 1984 it appeared that the majority of leasing transactions were opportunity rather than expansion related. High interest rates negatively impact the profitability of firms, and therefore expansion plans are postponed. However, because of the attractiveness of deals many firms are upgrading their accommodations while downsizing the overall space requirements. This is particularly evident when

one compares the vacancy and absorbtion rate of Class A space with the same rates for Class B space. In most Canadian markets the former generally exceeds the latter and the absorption rate has been increasing steadily since 1982 - some cities have experienced two to three fold increases.

There are a number of factors which influence absorption levels. There is a continuing demographic shift in the North American population, causing rapid growth of the office-oriented work force.

There is also growth in the floor space per worker ratio. For example, in Toronto this ratio has increased from 130 sq. ft. per worker in 1951 to 270 sq. ft. per worker in 1984. This factor is partially due to the trend toward moving administrative operations to the suburbs where land is less expensive and thus the amount of floor space per office worker has grown dramatically. The consolidation of several service industries (such as finance) may slow the rate of growth of the office population but space requirements will increase due to the growth in the floor space per worker ratio.

In many cities, the Class A stock is now aging and requires either demolition or major renovation. While this work is ongoing, the space is not available for occupancy, thus resulting in an over statement of the actual vacancy rate. (Renovation may also be a potential market for stone).

Another factor is the continuing move to suburbia because of convenience, low rates, and the capacity to create special purpose buildings for specific users. In some core markets, mixed use developments combining office, retail, apartment and commercial accommodation space are the only method of attaining financial viability in the light of high land and construction costs. Due to high construction costs there will be far less speculative office space built in the future.

There will be a continued trend towards moving from old Class c and D buildings to new buildings particularly in an oversupplied market because landlords are offering attractive deals (cash, free rent, equity) to perspective tenants.

7.3 New Construction Techniques

There are several new construction techniques which generally reduce costs and construction time, thus enhancing the competitiveness of natural stone as a building material.

The primary change taking place involves the application of stone veneer as part of a panel system, best described by the following examples.

A building was recently surfaced with 10,000 square feet of travertine marble tile, 3/8 inches thick and 15 3/4 inches square, by using a panellized system. The step by step procedure involved the following: steel stud frames were fabricated by welding studs and cross bracings; the frames were faced with a cement backer board; the marble tiles were set against the cement backer using mortar and the joints grouted. The panel (as large as 20 feet by 9 feet) is then cleaned and loaded onto a truck for delivery to the job site. Individual panels were numbered to indicate their location on the building. The panels were lifted into place and welded to the structural steel framework of the building. There are several variations of this process but basically the intent is to fabricate a large rigid panel from thin veneer stone and a framework of metal/precast concrete.

Another process has been recently invented and patented but it is not known if it has actually been used in construction. Mounted to each side of a conventional rough sawn slab is an aluminum honey-combed panel permanently bonded with an epoxy resin. Precision saws split the slab lengthwise into two panels consisting of the stone veneer backed by the aluminum panel. The panel is then polished, finished and cut to the customer's specifications. The end product is a panel 4 feet by 8 feet with

a nominal thickness of 1 inch, weighing less than 500 pounds. These panels are fabricated at an Irish plant which is capable of producing up to 3 million square feet of panels per year.

Another important facing system technique involves the use of the stone as an integral part of the building, interfacing with other components such as windows. An example of this application is the 54 storey Equitable Tower West in New York City which was clad with a curtain wall consisting of granite, limestone, aluminum and glass. The panel system consisted of pre-engineered elements and components which were integrated at the job site, simplifying delivery, storage, staging and scheduling. Use of this system allows installation of the stone into the panel to take place indoors. Work can thus continue in inclement weather. The alignment of the stone within the panel is automated, thus eliminating costly labour to adjust for true and plumb. This also serves to reduce the extent of human error and mechanical material failures. It is estimated that this construction technique saved up to seven months of building time on a $175 million dollar project.

Another curtain wall system consists of spandral panels 15 ft high by 7 ft in width. Each panel consists of 3/8 inch thick granite tiles one foot square, set in a latex based mortar on panels of reinforced board. The panels are assembled at the factory, thus eliminating the need for a masonry contractor to set the tiles at the job site. This saves considerable time and reduces the crew size to one third of normal requirements. With this technique, the completed panels form a "guttered" system designed to drain moisture out and provide a weather-proof wall.

The panel/curtain wall systems offer many advantages. These include:

- ability to enclose the building shell rapidly and thus accelerate the work of other trades which reduces the time and cost of other phases of construction;

- reduction of building site crew size;

- improvement of quality control over stone setting because the panels are fabricated in an enclosed factory environment;

- pre-storage of panels at job site thus eliminating construction delays while waiting for stone delivery;

- use of thin granite tiles which saves approximately one-third of the weight of normal granite slab cladding; and

- less and more easily inspected connections to the building.

The use of panelized systems also allows better connections to the building frame. For example, stone connections to the "pre-cast concrete sandwich" (pre-cast concrete panels veneered with marble or granite slabs) are usually done with hairpin anchors or simple cross dowels. In contrast, the stone connections to the curtain wall trusses can be done with a wider variety of anchoring devices, such as plug anchors, J-type back anchors, bent rods or extruded aluminum shapes attached to slots cut in the edges of the stone slab. More recently, the aluminum members of the curtain-wall system are often used to support the stone panels in a manner similar to glass panels, which increases the simplicity of cladding a high rise building.

All of these developments serve to reduce time and cost in the use of building stone. They also eliminate many of the annoying problems associated with shimming stone: the necessity of ensuring that the installation is true and level on the job site, the need to carry out make-shift repairs of stone and unauthorized cutting of steel support components due to "correcting" for field conditions.

7.4 Substitute Products

There are many products now on the market which simulate the appearance and texture of natural stone. The use of these products is increasing primarily due to their light weight and lower cost as compared to natural stone. Three alternatives are discussed below.

Manufactured stone has been in existence for a long time, but in recent years has been used in thin wall exterior or interior cladding applications. One of the best known products of this nature is fabricated in Canada by Ariscraft Corporation of Cambridge, Ontario. Known as Renaissance Stone, this product is a high density, severe weathering calcium silicate structural building stone produced by a unique cement/concrete free process of Ariscraft Corporation's own development. The product has been used with great success in installations such as Trinity Square Park in Toronto, Barrie Civic Centre, in Barrie, Ontario, and the Metro Centre Central YMCA in Toronto.

A very recent development, is the production of light-gauged galvanized steel "outsulation" panels, which are being produced by two Canadian companies under license agreement with U.S. based Dryvit Systems Inc.. These pre-formed panels are built in four basic steps:

- A heavy gauged galvanized steel structure is welded together from pre-cut steel ribs. The shape of the steel is dictated by the architectural line of the building;

- A sheet of water resistent gypsum board (sheet-rock or gyproc) is applied;

- A sheet of rigid foam insulation is applied and covered with a fiberglass reinforcing mesh, surfaced with a coat of 100% acrylic

polymer and portland cement to provide an adhesive base;

- The final surface finish is then added. This is 100% acrylic polymer with colour and a roughing agent which allows the outside finish to be trawled to a stucco look or sand-blasted finish.

The advantages of these panels are similar to those of the curtain wall system using natural stone. The principal advantages include lower than conventional construction costs due to the lighter weight and reduced structural steel demands for the building skeleton. The panels are available in a range of textured surface finishes and colours. The panels can be pre-fabricated in a heated indoor building. The insulation in the panels also enhances the thermal value of the building's insulation where it is not desirable to add insulation from the inside. The panels are also very suitable for exterior applications involving renovation or rehabilitation of older buildings.

Supra-Slate is a fabricated slate product that is produced by the Supradur Manufacturing Corporation of Rye, New York. Supra-Slate is made from a cement/asbestos compound and measures 9.35" x 16" x 0.25". It is manufactured in grey, black, green and red colours with two sets of pre-drilled nail holes.

Supra-slate weighs 500 lbs/square and has a 7" exposure to weather. It may be used for straight or staggered butt applications, has a class A fireproof rating, and has a life expectency of 75 years. It is 33-75% less expensive than natural slate depending on the quality.

It is very popular in home construction and also for institutional use where a durable product performance is desirable.

Supra-slate is supplied from the distributor to contractors at U.S. $161/square but this does not include shipping or handling. Although supra-slate is less heavy than slate shipping can be fairly expensive depending on distance.

7.5 Use of Computers in Stone Fabrication

Computers are being used in many applications in the stone industry. These include standard applications of readily available hardware and software for inventory tracking from extraction through fabrication to shipping; control of automated machinery and record keeping. But the most effective use of computers is in the reduction of waste in the fabrication process.

Software is now available which, based upon architectural drawings, can generate detailed information on the type and number of pieces. Slabs, prescreened for defects by lasers, are selected and cut under computer control to provide maximum usable yield. Computers also allow the ability to provide automated rapid dimensional change without affecting precision and to cut different sized pieces out of one large slab.

Computers are used to control a wide variety of tools which improve precision, reduce wastage, reduce required labour input, and equipment downtime. These improvements reduce costs and improve quality. New tool developments include:

- robot tables for transferring slabs from one work station to another;
- polishing machines which can automatically change abrasive bricks;
- high-precision conveyors;
- automatic multi-disc saws which can be positioned to cut different dimensions out of

one slab and operate accurately at speeds of 40 cm/hr; and

- automatic cross-cut positioning and cut-off.

Tools can be set up for different cuts automatically by one operator in less than a minute to a cutting precision tolerance of one-tenth mm. There are also special tools for milling slots and holes with equivalent accuracy.

For example, the Linde Marble Cutter traces paper or wood patterns using an optical system built into the machine's computer. Once traced, the pattern is stored in memory. Using the computer keyboard, all pre-programmed shapes can be retrieved from memory and the router technology based cutter can cut two dimensional shapes in a fraction of the time traditionally needed.

The advancements made in sawing stone are probably the most important single factor which has allowed higher operating speeds, improved efficiency and operating economy and consequently increased availability.

The end result of the application of computer technology to the stone industry is analogous to the micro-electronic industry - costs are decreasing with savings being passed on in the form of reduced prices. Quality and ease of handling natural stone are continually improving. This makes stone very competitive in comparison to other cladding materials.

A specific example of the application of new technology is the ability to process a uniform line of foot square granite tiles of consistent thickness. The market for similarly dimensioned marble tiles has been well established but, before the arrival of new technology, it was too difficult and uneconomical to permit tile production in granite. This is now possible with the introduction of calibrated and programmable machines (saws, polishers) and automatic handling equipment. These tiles are

expected to find a ready market place in, for example, the panelized cladding systems where consistent dimensions and thickness will allow inexpensive and easy installation within the panel framework.

7.6 Summary

The impact of new building construction and stone production technology is extremely positive in terms of enhanced stone demand.

In summary, the benefits include:

- reduced costs and hence improved competitive position for stone;
- reduced "nuisance" factors associated with working with a natural material; and
- improved construction speed.

These factors coupled with the emerging post-modern architectural style may result in designers and developers considering stone applications to a much greater extent in future projects.

8.0 CONCLUSIONS

Phase I

1. There is a definite trend towards greater use of stone in the industrial, commercial and institutional construction industry. Hard data is difficult to acquire but most industry participants describe the strength of this growth as "phenomenal".

2. The major consuming groups are large privately financed commercial office building projects and, to a lesser extent, publicly sponsored institutional projects such as museums, court houses and administrative complexes.

3. In eastern Canada, the major consuming centre is Toronto and its immediate vicinity; closely followed by Ottawa. Use of stone in Montreal may be developing as evidenced by the recent construction of the Industrial Life Tower.

4. In the United States the major consuming area is the southern states with an approximate 40% of total market share; major consuming cities include Los Angeles, New York City, Dallas, Houston, San Diego and New Orleans.

5. It is tenuous to generalize regarding stone type, colour and finish as every project is unique. However, the thin veneer granite panel in approximate dimension of 1000 mm x 500 mm x 32 mm installed as a steel truss or precast frame is the most widespread application.

6. Stone is quarried and fabricated literally all over the world. The survey conducted as part of this report, while not exhaustive, indicates that the most popular sources in North America are the United States, Scandinavia, Italy and Quebec. The most popular fabricators are Italy, U.S. and Quebec.

7. The stone industry is highly fragmented and consists of many small producers who have developed links with their clients, installers and agents over a long period of time, primarily due to habit and reputation. The industry exhibits strong vertical and horizontal integration. However, because of the variety inherent in the natural material no industry participant can hope to supply the full spectrum of products. It is thus, very difficult to determine a market share for either captive or independent sources.

8. Architectural specifications regarding stone use are project-specific but are usually based upon a "reference sample" method to ensure uniformity of colour, grain, finish, texture, etc. Materials composition specifications have reached an advanced state of development.

9. The delivered cost of building stone varies substantially and depends upon several factors, including:

   - total project area;
   - distances: quarry to fabricator to site;
   - type of stone; and
   - total activity in building area.

   Generally, the average cost of installing granite veneer is approximately $35 per square foot.

10. Overland transportation is almost exclusively by truck. Stone is shipped from the quarry in either rough block (approximately 35 tons) or rough slabs (2" - 5" thick). Finish product is packaged and usually containerized. The cost of overland transportation varies greatly depending upon the dimensions and packaging of the stone.

Phase II

11. If the proportionate share of the value of apparent stone consumption to the value of construction activity remains stable or increases, the demand for stone will be strong over the next decade.

12. For the most part, off-shore granite remains the most popular for exterior cladding applications. The most popular Canadian granites are obtained from Quebec.

13. Word of mouth is the most prevalent method of obtaining information related to availability, contractors capability and prices. Some stone suppliers and fabricators do no advertizing at all.

14. Several new simulated stone products are available on the market. These will be used on some projects but are unlikely to replace the use of natural stone on "prestige" projects.

15. Technological change will have a beneficial impact on the stone industry; new tools, processing and installation techniques will in increase timely availability and reduce, or hold, prices.

APPENDIX A

STATISTICAL OVERVIEW

NOTE: The following tables involve a variety of units. The conversion factors required to relate some of the tables are as follows:

1 cubic metre = 35.315 cubic foot
1 cubic foot = 0.028 cubic metre
1 cubic metre = 2.977 short ton
1 cubic foot = 0.084 short ton
1 short ton = 11.861 cubic foot
1 short ton = 0.336 cubic metre

EXHIBIT A-1: PERTIMENT DIMENSION STONE STATISTICS IN THE UNITED STATES (THOUSAND DOLLARS, THOUSAND SHORT TONS)

	1980	1981	1982	1983	1984
Sold or Used by Producers: (Short Tons)	1,315	1,331	1,089	1,090	1,157
Dimension Stone Value ($)	138,900	150,500	145,113	149,483	154,949
Exports (Value) ($)	15,107	20,698	18,678	21,285	26,318
Imports for Consumption: (Value)					
Dimension Stone ($)	88,900	132,904	169,874	195,378	231,678
Apparent Consumption ($) (Total value minus exports plus imports)	212,693	262,706	296,309	323,576	360,309

Source: Bureau of Mines, Minerals Yearbook, 1981, 1983, 1984, United States Bureau of the Interior.

EXHIBIT A-2: APPARENT CONSUMPTION OF DIMENSION GRANITE IN THE UNITED STATES (INCLUDING MONUMENTAL, CONSTRUCTION, CURBING AND MISCELLANEOUS)

	1980	1981	1982	1983[r]	1984
DIMENSION GRANITE SOLD OR USED (A)					
Quantity Short Tons	661,559	681,550	680,800	600,640[r]	638,000
Value ($ Thousands)	79,930	82,870	78,500	88,096[r]	95,000
EXPORTS OF DIMENSION GRANITE (B)					
Quantity Short Tons	88,000	88,000	N/A	N/A	---
Value ($ Thousands)	5,928	7,880	8,736	9,536	13,773
IMPORTS OF DIMENSION GRANITE (C)					
Quantity Short Tons	N/A	N/A	N/A	---	---
Value ($ Thousands)	22,768	45,551	75,889	84,951	78,465
APPARENT CONSUMPTION (A-B+C)					
Value ($ Thousands)	96,770	120,541	145,653	163,511	159,692

r = revised
e = estimate
Short Ton = 2,000 pounds
N/A = Not Available

Source: Bureau of Mines Mineral Yearbook, 1981, 1983, 1984
United States Bureau of Interior.

EXHIBIT A-3: DIMENSION GRANITE SHIPPED FROM CANADIAN QUARRIES

	1978		1980		1982		1983	
	Metric Tonnes	000$	Metric Tonnes	000$	Metric Tonnes	000$	Metric Tonnes	000$
Building Stone	26,935	1,166	25,472	2,005	26,831	2,653	41,184	5,186
Monumental	23,805	1,743	16,821	1,822	37,518	3,910	20,480	3,047
Others	13,278	620	23,958	966	5,665	415	7,659	392
TOTAL	64,018	3,529	66,251	4,793	70,014	6,978	69,323	8,625

Source: Statistics Canada, Catalogue 26-225

EXHIBIT A-4: MEDIAN VALUE OF IMPORTED ROUGH GRANITE IN CANADA BY COUNTRY OF ORIGIN

	1981	1982	1985
	$/Metric Tonne	$/Metric Tonne	$/Metric Tonne
South Africa	175	171	167
U.S.A.	58	121	189
Finland	140	46	164
India	232	348	179
Norway	39	196	266
Italy	423	321	791
Uruguay	56	--	--

Source: Statistics Canada, Imports by Commodities and Countries, Catalogue No. 65-207

EXHIBIT A-8: CANADIAN STONE EXPORTS BY COMMODITY AND COUNTRY

	1981		1982		1983		1984		1985	
	Q	V	Q	V	Q	V	Q	V	Q	V
BUILDING STONE ROUGH										
U.S.A.	11,958	1,167	2,291	505	5,849	876	9,052	1,456	10,464	1,371
Japan	351	54	605	63	2,319	418	801	143	295	69
Italy	---	---	---	---	4,297	564	1,322	186	1,750	217
Others	18	1	46	8	168	17	---	---	---	---
TOTAL	**13,327**	**1,222**	**2,942**	**516**	**12,633**	**1,877**	**11,175**	**1,785**	**12,509**	**1,657**
NATURAL STONE BASIC PRODUCTS										
U.S.A.		9,616		16,813		17,004		21,551		21,400
Japan		425		1,443		1,181		521		454
Italy		54		231		555		764		414
France		78		101		52		38		89
Others		186		1,013		4,194		6,103		2,024
TOTAL		**10,359**		**19,603**		**22,987**		**28,977**		**24,381**
Stone, nes Total	116,782	1,693	16,170	559	45,779	707	208,837	1,432	171,452	1,386

Notes: Q = quantity in tonnes; V = Value in $000

Source: Statistics Canada, exports by commodity and country, Catalogue 65-202

EXHIBIT A-9: DIMENSION GRANITE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY STATE

	1980		1981		1982		1983		1984	
	Short Tons	Value ($000)	Short Tons	Value ($000)	Short Tons	Value ($000)	Short Tons	Value ($000)	Short Tons	Value ($000)
California	9,670	1,180	8,133	1,045	NA	NA	5,823	1,975	W	W
Connecticut	8,480	413	10,234	438	NA	NA	9,773	662	W	W
Georgia	199,249	9,646	249,192	11,217	249,000	11,800	176,838	10,199	179,000	9,500
Maryland	---	---	28,997	779	NA	NA	NA	NA	--	--
Massachusetts	49,719	W	48,557	8,504	49,000	8,600	49,280	W	55,000	W
Minnesota	32,359	11,917	29,450	11,540	24,500	9,500	W	W		
New Hampshire	103,039	7,167	88,902	6,889	107,000	7,500	57,512	40,325	8,700	4,200
North Carolina	49,169	3,849	24,233	2,130	24,300	2,200	80,096	7,187	W	W
Oklahoma	7,292	559	5,954	569	NA	NA	5,396	652	W	W
South Carolina	11,660	703	17,750	1,109	13,500	900	17,113	199	16,100	1,100
South Dakota	42,315	15,035	50,188	17,543	47,500	16,300	42,864	15,952	59,600	18,600
Texas	21,521	6,399	17,458	3,796	NA	NA	39,994	10,663	37,000	11,000
Vermont	94,565	11,780	91,371	13,420	84,000	11,700	W	W	W	W
Other (1)	32,521	11,283	11,331	3,893	82,000	10,000	128,815	34,402	232,600	50,600
TOTAL (2)	**661,559**	**79,930**	**681,550**	**82,870**	**680,800**	**78,500**	**616,469**	**88,907**	**638,000**	**95,000**

Notes: NA = Not Available; W = Withheld to avoid disclosing company proprietary data; included with other.

(1) = Includes: Calorado, Maine, Maryland, Minnesota (1983), Missouri, New York, Pennsylvania, Rhode Island, Washington and Wisconsin.

(2) = Data may not add to totals shown because of independent rounding.

Source: Bureau of Mines and Minerals Yearbook, 1983, 1984, United States Bureau of Interior.

EXHIBIT A-10: DIMENSION GRANITE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY USE

	1979		1981		1983[r]	
	m^3	Value ($000)	m^3	Value ($000)	m^3	Value ($000)
ROUGH STONE:						
Rough blocks	28	3,600	26	4,628	52	16,411
Irregular-shaped stone	4	485	13	1,273	15	2,310
Rubble	6	238	31	3,653	--	---
Monumental	8	21,511	62	21,535	78	22,760[r]
Flagging	W	W	0.7	21	--	--
Other	0.06	14	0.06	12	0.07	16
DRESSED STONE:						
Cut stone	20	13,918	20	16,306	)18	17,722[r]
Sawed stone	1	181	3	767	)	
House stone veneer	2	167	2	169	)	
Construction	2	690	1	673	5	1,290[r]
Monumental	16	19,864	17	22,468	24	18,266
Curbing	33	7,572	35	10,336	21	8,709
Flagging	W	W	0.5	92	) 2	610
Paving block	W	W	1	373	)	
Other	4	1,007	0.7	566	)	
TOTAL(1)	**194.06**	**69,246**	**212,96**	**82,870**	**215.07**	**88,096r**

r = Revised, m^3 = Cubic Metres (thousands), W = Withheld
(1): Data may not add to totals shown because of independent rounding.

Source: Bureau of Mines Minerals Yearbook, 1981, 1983, 1984, United States Bureau of the Interior.

EXHIBIT A-11: DIMENSION STONE SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY USE

	1980				1981				1983[r]			
	m^3	V	%	%V	m^3	V	%	%V	m^3	V	%	%V
Monumental	93	50,029	21	36	83	50,415	18	34	91	44,592	25	30
Curbing	39	10,519	9	8	36	10,388	8	7	32	12,598	9	9
Construc-tion	302	76,093	69	55	321	87,543	72	57	235	87,921	64	59
Others	6	2,266	1	1	8	4,117	2	2	8	2,732	2	2
TOTAL	440	138,907	100	100	448	150,463	100	100	366	147,843	100	100

m^3 = Cubic Metres (thousands)
V = Value (thousands)
% = Percentage Volume
%V = Percentage Value
r = Revised

Source: Bureau of Mines Minerals Yearbook, 1981, 1983 and 1984, United States Bureau of Interior

APPENDIX B
OVERVIEW OF STONE INDUSTRY ACTIVITY IN CANADA AND THE UNITED STATES

ATLANTIC CANADA

NEW BRUNSWICK

Supply

Granite deposits in the province are concentrated generally in Charlotte County between St. Stephen and Saint John, and in the southeast (Chiputneticook Lakes) to central (Nepisiguit River) regions. Past quarrying activity has been concentrated primarily in the St. Stephen, St. George and Bathurst areas; most of the stone being used locally or for larger buildings in Fredericton and Saint John; and exports included Spoon Island pink and blue to Halifax and Kingston; St. George red to Ontario, Quebec and the U.S.

Existing deposits include many colour variations from pink to black. At present there are only two operating quarries in N.B. (1) Nelson Monuments cuts stone in Hampstead for monument bases and granite curbing consumed within the province; (2) Smith Cut Stone and Quarries Limited in Shediac, quarries local red sandstone and produces dressed and shaped building stone. Both of these facilities were visited by the study team.

Nelson Monuments imports rough stone from the United States, Ontario, Quebec, Finland, South Africa and India. The rough stone is cut, dressed, shaped and polished into headstones at its plant in Sussex. Nelson also extracts a limited amount of grey granite from a quarry in Hampstead and the plant produces all of the granite curbing used by the New Brunswick Department of Transportation. The owner feels that the plant could also produce granite veneer for small projects (less than 5,000 square feet) if a large diameter diamond saw could be acquired.

The President of Smith Cut Stone refused to supply meaningful information regarding production. However, the operation is so busy that "no new orders are being accepted". The primary market areas are Boston and New York.

Demand

Historic data regarding consumption is not available as appropriate records have not been kept.

Mainstreet Revitalization is estimated to represent an annual market of approximately 4,000 cubic feet for granite curbing.

Present demand in the construction industry appears to be very small. The New Brunswick Construction Association indicates that future requirements will likely be limited.

NEWFOUNDLAND

Supply

At present there is limited production of stone in the province; most local requirements are imported. For example, Statistics Canada data indicates that of 165,000 metric tonnes of stone produced in 1983, 68,000 metric tonnes were of granite and that 148,000 metric tonnes of the total were used as crushed stone.

Preliminary investigations cautiously indicate that some areas of the Mount Ptyton Batholith are potential sources of dimension and memorial stone. The extent and amount of material has not been determined (Tomlin, 1982).

All previously quarried red, white and pink granite deposits in the province have potential for future developments (i.e. allow removal of $8m^3$ blocks); several other sites appear promising - Swift Current, Cambo-Middle Brook, Wesleyville, Gander, Harbour Breton and Burgeo (large block potential, samples polished well).

Demand

No data on historic consumption is available past 1974. Present demand in the construction industry appears to be small. The Newfoundland and Labrador Construction Association does not foresee a change in this situation.

Discussions with local architects indicate that building stone would be a preferred medium for exterior cladding on local buildings but for these constraints:

- Stone is cost prohibitive in comparison to precast concrete and reflective glazing;
- Provincial policy promotes use of local materials for construction of government buildings; and
- Newfoundland construction costs are generally 20% higher than mainland costs. This factor when coupled with the fact that most construction is financed by mainland institutions mitigates the use of stone.

The 1985 institution/commercial construction activity level in St. John's is high: convention centre/hotel, Bank of Nova Scotia, School for the Deaf, 150,000 square feet office building ,etc. However, a very small amount of building stone has been used in these projects; exterior cladding consists mostly of reflective glazing and pre-cast concrete. The future level of non-residential construction activity does not appear to be optimistic according to the Newfoundland and Labrador Architects Association.

NOVA SCOTIA

Supply

The major source of building stone in the province is Wallace Sandstone in Cumberland County. Their major market is for restoration work, but this is intermittent. The 1984 sales were 3,000 metric tons for use in restoration in Halifax but in other

years volumes may be negligible depending on what restoration is being done and whether the stone matches the building being restored.

Other building stone quarries have long since ceased operations, some as long as 50 to 100 years ago. Quarries were located across the province, but most were in Cumberland and Pictou Counties.

There are two producers of monument stone in the province: Heritage Memorials in Annapolis County, and Arsenault Monument Works in Antigonish County.

Heritage Monuments indicates consumption of approximately 8,000 to 9,000 cubic feet of dressed stone each year. About 40% of this total consumption is imported from Africa or India, the rest is from their quarry. The imported stone is black, which is the most popular colour. The grey, which is cheaper, is used for bases and less expensive items. About 60% to 65% of the stone they use is grey. Most of the remainder is black with some rose (George Nelson, 1985).

According to Nelson Monuments the major constraint facing the market is that it appears there is no supply of stone in Nova Scotia worth mining: Nova Scotia stone is fractured, expensive to mine, large enough pieces are scarce, and popular colours are not available; no other possible sources of supply (mainly ex-quarries) are economical to develop.

Arsenault Monument Works has not been actively quarrying for 17 years, but have a quarry of black stone and sandstone. It is estimated by Arsenault Monuments that it would cost about $100,000 to open up the black quarry, but it has been about ten years since the idea was seriously considered. Arsenault Monuments does not quarry sandstone due to the fact that there is large supply on hand with little demand (100 metric tons each year for monuments).

Demand

The main demand for stone at present is for restoration work. The N.S. Department of Mines and Energy receives seven or eight inquiries per year regarding the availability of Wallace sandstone which was used in the construction of buildings across Canada. In restoring a building, efforts are made to find stone from the same quarry that supplied the original stone.

The demand for monument stone is relatively stable. Imports account for 80%-85% of local requirements in block form. Nelson Monuments handles the imports for most of the other producers in Nova Scotia.

QUEBEC

Supply

Approximately 25 quarries were operating in Quebec in 1982, producing gray, pink, mahogany and black granites. Most production comes from the Rivière-à-Pierre, Lac Saint Jean and Guénette areas.

There are at least nine finishing plants concentrated mainly in the Eastern Townships, Trois Rivières, Quebec City and Lac Saint Jean areas. A new plant (Granicor) with ultramodern Italian designed equipment began operations near Quebec City in 1982.

Demand

In 1982, total Quebec granite sales amounted to $4.4 million for the monumental industry and $25 million for the construction industry. The latter sector is experiencing phenomenal growth.

This growth is due in part to the efforts of Association of Granite Producers of Quebec (AGPQ).

Up until the 1960's, Quebec granite producing technology was based upon traditional methods and product end use was primarily for bridge piers and construction blocks.

The establishment in 1967, of AGPQ instilled renewed vigour in the industry which resulted in increased activity in the early 1970's. However, the economic decline (particularly in the U.S.) after 1975 created serious problems and reduced activity for the stone industry.

Since 1978, the industry has entered a new period of growth. The value of production of rough granite increased 139% from 1978 to 1982. Granite veneer sales increased form $9.5 million in 1979 to $45 million in 1984. The AGPQ has forecasted sales of $60 million in 1985, or an increase of 530% over six years. Similar increases are foreseen for 1986 and 1987.

This growth has been attributed to the following factors:

- rediscovery of stone's unique qualities;
- architectural design of interior and exterior facings; and
- producers modernizing and increasing their capacity.

Production capacity has increased from 3.5 million square feet to 4.5 million square feet and further substantial increases are predicted to 1987.

One of the largest producers, Granicor Inc. has doubled its sales to $12 million over the period 1982-1984; and has a present capacity of 1 million square feet per annum. These capacity increases have permitted a reduction of veneer granite prices in the order of 15-20%.

Almost half of the rough stone cut from Quebec quarries is destined for export, with Columbia Granite (Lac Saint-Jean) and Dumas et Voyer (Rivière à Pierre) controlling 80% of the market. The latter quarry is considered to be one of the largest in Canada. Exports are shipped around the world but primarily to Europe and Asia. Exports of fabricated granite have increased from 44% in 1979 to approximately 80% in 1984. Some plants specializing in granite panels are exporting almost their entire production.

The growth in the export market is attributed to the quality and variety of Quebec granite as well as the speed and reliability of delivery. Similar growth has occurred in the monumental industry, however, no production figures are available.

The growth in the entire Quebec industry is underscored by two recent investments: $525,000 is being spent to reactivate a fabricating plant which went bankrupt in 1983. The new company, Granite St-Gérard (1985) Inc. employs 30 persons in the production of window ornamentation, curbing stones, floor tiles, facing panels and a variety of other products.

In another development, Granite Frontenac is investing $892,000 to expand its facilities and purchase new equipment. This company produces funeral monuments for export: 25% to the U.S. and 75% to Western Canada.

Current Activity

As Quebec represents one of the most important stone producing provinces, visits were made to a number of quarries and fabricating plants. The results of these visits are described below.

Les Carrières St-Marc

This firm is mainly involved in extracting and processing limestone (70%); the balance of their activity is granite

processing (30%). Granite is purchased primarily from other quarries in Quebec. For example, pink granite is obtained from St. Alban; blue granite (midnight blue) from Notre-Dame des Anges. Total yearly production is approximately 70,000 square feet for a value of $1,600,000. The firm intends to undertake an expansion next year but declined to provide details except to indicate that the purchase of a new saw and planer was necessary to maintain its competitiveness and increase output. A principal in the firm has indicated that business has been "excellent" since 1979.

Most of their contracts are institutional, such as:

- Musée de l'homme, Quebec
- Marché Métro
- Post Office in Moncton; and
- Sobey's building.

The firm sells rough stone to a Montreal finishing plant (Montval à Terrebonne) for processing.

Granit Bussières

This company has been in business for 75 years. The owner, Marc Bussières, is also the President of the Association of Granite Producers of Quebec. The annual sales are estimated at $6-8 million, primarily to the construction industry.

This company is presently investing to modernize its cutting and planing facilities in order to derive a higher quality product and increase the value added during processing. The plant works at almost 100% of capacity, producing approximately 600,000 square feet per annum mainly for institutional construction projects.

Granit Lacroix

This company was created in 1962 and employs 60-65 persons. Their major products include granite veneer, stairs, column bases

and wall panelling. The firm's order books are full for the next two years (annual capacity of 800,000 square feet), after which a slight slow down is expected. Their major concern is an anticipated large increase in the supply of final product. Granit Lacroix exports 80% of its production to New York and Japan (unfinished material). The largest clients are real estate developers, mostly located in New York, Texas, Washington and Canada. The annual sales are estimated at $6-8 million.

Le Roc d'Argent

This company is mainly involved in the production of funeral monuments and funeral vases. However, it is considering expanding into the building stone market because, in their opinion, the monument industry is a declining market.

In order to be eligible for a grant to buy modern equipment, Le Roc d'Argent has purchased a quarry, at Stratford, Quebec. Upon completion of a market study the firm intends to invest in the order of $400,000 in addition to $150,000 recently spent, to acquire a wire diamond saw from France, to produce grey granite.

Association des Producteurs de Granit du Québec

The headquarters of the Association is located in Quebec City, and its membership includes all the quarries of Quebec as well as one quarry from Vermillion Bay, Ontario (Nelson).

An official with the association has indicated that the building stone market is "booming". In 1979, the value of production represented $9,000,000 while in 1984 it is close to $70,000,000. Production supply is estimated at 5-7 million square feet. The Association is expecting two more years of continued and sustained growth in production. Further discussions revealed that several new investment projects are now at the study phase which are anticipated to lead to successful implementation.

ONTARIO

Supply

While granite deposits are considered to be extensive throughout Ontario, there are only approximately a half dozen suppliers currently active in the industry, and primarily located in the Toronto area. Visits to two operations were undertaken.

Arriscraft Corporation in Cambridge has recently changed its name from Angel Stone - a term which has become generic terminology for manufactured stone - the company's major product. The change of name has come about because of the growing importance of quarried stone - particularly Adair marble, a white dolomite extracted from the Bruce peninsula - to the company's operations. Recent Adair marble installations include the Rideau Canal restoration, Ottawa; Province of Ontario Court House; Ottawa Registry office; Bank of Nova Scotia, Ottawa; and One University Avenue, Toronto. The stone has also been fabricated into pavers for Dalton Park, several residential applications and 500,000 square feet for the Port of Quebec restoration. Plans are being developed for a veneer application of this product to the Canadian Chancellery in Washington, D.C. The firm is actively searching for new sources of supply in other areas of Ontario.

James N. Scott Cut Stone in Toronto is a specialty stone cutter and shaper catering to primarily the restoration market. Most stone used is Indiana Grey limestone imported from Bedford, Indiana. the firm is presently involved in restoration of the Ontario Legislative Buildings using stone extracted from New Brunswick. The owner of the operation indicated that the facility's output is booked four months in advance.

Demand

Discussions with several local architects indicate that Ontario represents an important consumption area particularly in Toronto and Ottawa, where several projects have been recently completed,

are underway, or are in the planning and design stage. In order to summarize current trends a list of important projects is provided at Exhibit B-1.

While this list is by no means exhaustive, the exhibit indicates that Toronto is presently the major consuming centre in Canada. The use of building stone in these projects involves a wide range of type, colour, finish and installation technique.

EXHIBIT B-1: IMPORTANT ONTARIO PROJECTS

PROJECT	ARCHITECT	STONE TYPE (Cladding Area)	STONE SOURCE Quarry (Fabricator)
Ontario Court House, Ottawa	M.C.A.	Adair Marble (150,000SF)	Ontario (Ontario)
Bank of Nova Scotia, Ottawa	Carruthers, Shaw Partnership	Adair Marble (20,000SF)	Ontario (Ontario)
One University Ave., Toronto	Brisbin, Brook Beyon	Adair Marble	Ontario (Ontario)
95 Wellington St., Toronto	Pellow Architects	Texas Red (100,000SF)	Texas (Quebec)
Scotia Plaza, Toronto	WZMH	Napoleon Red (1,000,000SF)	Scandinavia (Italy)
Metropolitan Police HQ, Toronto	Shore Tilbe Mathers & Haldenby	Brazilian Red (200,000SF)	Brazil (Italy)
First Canadian Place, Toronto	Bregman and Hamann	White Marble (450,000SF)	Italy (Italy)
Sun Life, Toronto	WZMH		Vermont (Minnesota)
Standard Life Centre, Toronto	Arthur Lau	Atlantic Pink	Quebec (Quebec)

Source: The DPA Group Inc.

REST OF CANADA

A comprehensive survey of the use of dimension stone in the rest of Canada has not been undertaken. However, limited discussions with the industry indicate that Calgary and Vancouver are the major consuming centres. First Alberta Place recently constructed in Calgary, is clad entirely in granite from Minnesota. First Canadian Centre (Bank of Montreal), Calgary, also involves stone cladding and the Petro Canada Building, Calgary is clad with red granite from Finland, fabricated in Italy.

UNITED STATES ACTIVITY

In the United States there are in the order of 250 companies producing in 33 states. The major production centres are in three states - Vermont, Georgia and Indiana - accounting for approximately 44% of the total domestic production.

U.S. production has comprised the following stone types:

	1982	1983
. Granite	51%	55%
. Limestone	21%	23%
. Sandstone	13%	12%
. Slate	9%	11%
. Marble	4%	3%
. Traprock	1%	--
. Other	1%	1%

In 1983, U.S. stone consumption was distributed as follows:

. Building and Construction	35%
. Monumental)	
. Rough Stone)	49%
. Rubble)	
. Flagging	8%
. Curbing	7%
. Others	1%

A telephone survey of major producers in the northeastern U.S. was undertaken in an effort to determine levels of production, major market areas, prices and specifications. For the most

part, the companies contacted were reluctant to provide meaningful information. A summary of interview results appears at the end of this Appendix.

The companies contacted, plus approximately a dozen others account for over half of the U.S. production. The export value of U.S. stone has remained constant at approximately $200 million for the past five years.

Import value has increased approximately 125% to $200 million in the last three years. Imported stone from Canada, Brazil and India showed the greatest increases.

It was felt that an exhaustive survey of U.S. producers, architects and developers would not only be cost-prohibitive, but likely result in information of marginal application to this study. As an expedient alternative to acquire a "feel" for current activity, discussions with key informants were combined with a perusal of several building stone trade journals. This exercise provided an indication of the characteristics of several major projects which have completed in recent years. These projects are listed in Exhibit B-2.

Foremost amongst these projects is Battery Park City, a development of Olympia and York which involved the use of 1.5 million square feet of polychrome granite extracted from Columbia Granit's quarry in La Baie, Quebec and fabricated by Granicor located near Quebec City.

EXHIBIT B-2: IMPORTANT U.S. PROJECTS INVOLVING DIMENSION STONE USE

PROJECT	ARCHITECT	STONE TYPE (Cladding Area)	STONE SOURCE Quarry (Fabricator)
Seaport Plaza New York		N/A (250,000SF)	N/A (Quebec)
San Felipe Plaza		N/A (200,000SF)	N/A (Quebec)
LTV Building Dallas		Autumn Brown Granite (80,000SF)	Quebec (Quebec)
Battery Park City, New York		Polychrome Granite (1,500,000SF)	Quebec (Quebec)
1155 Avenue of the Americas, New York		Black granite (300,000SF)	Brazil (Ireland)
Wilshire Courtyard, Los Angeles	MeLanand Vasquez & Partners Inc.	Carmen red granite (250,000SF)	Finland (Italy)
Wyndham Hotel Dallas	Dahl/Braden & Chapman Inc.	Indian sunset granite	(Minnesota)
One Poydras Plaza, New Orleans	3D/International	Baltic brown granite (125,000SF)	Finland (Italy)
First City Centre, Dallas	WZMH Partern-ship	Carmen red granite (400,000SF)	Finland (Italy)
101 California San Francisco	Johnson/Burgee	Spanish pink granite (250,000SF)	Spain (Italy)
Philipp Morris Head Office, New York	Ulrick, Frazen		N/A (Quebec)
Southwestern Bell Headquarters Dallas		Continental Buff travertine (600,000SF)	Idaho (Idaho)

EXHIBIT B-2: IMPORTANT U.S. PROJECTS INVOLVING DIMENSION STONE USE

PROJECT	ARCHITECT	STONE TYPE (Cladding Area)	STONE SOURCE Quarry (Fabricator)
Seaport Plaza New York		N/A (250,000SF)	N/A (Quebec)
San Felipe Plaza		N/A (200,000SF)	N/A (Quebec)
LTV Building Dallas		Autumn Brown Granite (80,000SF)	Quebec (Quebec)
Battery Park City, New York		Polychrome Granite (1,500,000SF)	Quebec (Quebec)
1155 Avenue of the Americas, New York		Black granite (300,000SF)	Brazil (Ireland)
Wilshire Courtyard, Los Angeles	MeLanand Vasquez & Partners Inc.	Carmen red granite (250,000SF)	Finland (Italy)
Wyndham Hotel Dallas	Dahl/Braden & Chapman Inc.	Indian sunset granite	(Minnesota)
One Poydras Plaza, New Orleans	3D/International	Baltic brown granite (125,000SF)	Finland (Italy)
First City Centre, Dallas	WZMH Partern-ship	Carmen red granite (400,000SF)	Finland (Italy)
101 California San Francisco	Johnson/Burgee	Spanish pink granite (250,000SF)	Spain (Italy)
Philipp Morris Head Office, New York	Ulrick, Frazen		N/A (Quebec)
Southwestern Bell Headquarters Dallas		Continental Buff travertine (600,000SF)	Idaho (Idaho)

EXHIBIT B-2 (continued)

William Square Irving, Texas		Texas pink granite (600,000SF)	Texas (Texas)
Waverly Hotel Atlanta	Finch,Alexander Barnes, Roths- child & Paschal	Continental buff travertine (50,000SF)	Idaho (Idaho)
1615 Poydras New Orleans	HOK	Verde Fieriota granite (150,000SF)	India (Italy)
Exxon Building New Orleans	Sikes, Jennings & Kelly	Impala black granite (100,000SF)	South Africa (Italy)
Energy Centre New Orleans	Harwood K. Smith	Spanish pink granite (200,000SF)	Spain (Italy)
Texaco Building New Orleans	Studmore, Owings & Merril	Impala Black Granite (150,000SF)	South Africa (Italy)
Texas Commerce Tower, Houston	IM Pei-3D/ International	Regal Grey granite	(New Hampshire)
Arco Tower Dallas	IM Pei	Regal Grey Granite (150,000SF)	Vermont (Italy)
Museum of Art Dallas, Texas		Buff limestone (225,000SF)	Indiana (Indiana)
Equitable Life Tower, New York		Buff limestone	Indiana (Indiana)
Municipal Complex Dade County		Buff limestone (300,000SF)	Indiana (Indiana)

Source: The DPA Group Inc.

APPENDIX C

CONSTRUCTION ACTIVITY - FUTURE TRENDS

Canadian Construction Sector - Background

In order to provide context, an overview of recent construction performance in Canada is shown at Exhibit C-1. This exhibit shows the major construction categories which could account for stone use. Values are expressed in current dollars ($ billion). All types of construction have been relatively stable over the past few years. The major users of dimension stone are new commercial and institutional structures. These categories have a historical combined construction value of approximately $7 billion per annum.

EXHIBIT C-1: TOTAL VALUE OF NEW CONSTRUCTION WORK PURCHASED IN CANADA, 1981-1985, ($BILLION, CURRENT)

Type	1981	1982	1983	1984	1985
Total Construction	47.9	46.5	45.7	45.5	47.7
Of Which: Total Building Construction	25.9	22.8	24.1	24.4	25.3
Of Which: Residential	13.1	10.2	13.0	12.5	12.7
Commercial:					
Hotels, etc.	0.5	0.5	0.4	0.5	0.5
Office Buildings	2.9	3.2	2.8	2.9	3.1
Stores	1.4	1.1	0.9	0.9	1.0
TOTAL	4.8	4.8	4.1	4.3	4.6
Institutional:					
Education	0.9	1.0	1.0	0.9	1.1
Religious	--	0.1	0.1	0.1	--
Health	0.8	0.9	0.9	0.9	0.9
Other	0.4	0.4	0.5	0.6	0.6
TOTAL	2.2	2.5	2.5	2.5	2.6

Source: Statistics Canada, Catalogue 64-201
Note: Numbers do not total due to exclusion of non-relevant categories.

An indication of the Atlantic Canada share of total value of construction is provided in Exhibit C-2. This exhibit shows that, in terms of total construction, each Atlantic province accounts for between approximately 2% and 4% of total value. Nova Scotia leads the other provinces in total building construction and in commercial construction. However, in institutional construction, New Brunswick leads by a substantial margin in the years exclusive of 1985.

EXHIBIT C-2: TOTAL VALUE OF NEW CONSTRUCTION WORK PURCHASED PERCENT SHARE, ATLANTIC CANADA 1982-1985

	1982	1983	1984	1985
Total Construction				
NB	1.8	2.0	2.1	1.9
NS	2.7	3.9	4.0	4.1
PEI	0.2	0.3	0.3	0.3
NFLD	2.2	2.8	2.8	2.7
TOTAL	6.9	9.0	9.2	9.0
Total Building Construction				
NB	2.1	2.4	2.3	2.2
NS	2.3	2.8	3.1	3.3
PEI	0.2	0.3	0.4	0.4
NFLD	1.3	1.6	1.5	1.6
TOTAL	5.9	7.1	7.3	7.5
Commercial				
NB	1.7	2.0	1.7	1.6
NS	1.6	2.4	3.4	3.4
PEI	0.3	0.5	0.3	0.1
NFLD	1.0	1.0	1.0	1.2
TOTAL	4.6	5.9	5.5	6.3
Institutional				
NB	3.8	4.2	5.2	5.0
NS	2.3	2.7	3.0	4.4
PEI	0.4	0.2	0.6	1.0
NFLD	1.9	2.1	2.5	2.8
TOTAL	8.4	9.2	11.3	13.2

Source: Adapted from Statistics Canada, Catalogue 64-201

Canadian Construction Sector - Outlook

Sectoral forecasts provided by the Conference Board of Canada and Informetrica Ltd. indicate the likely level of future construction activity for all provinces of Canada.

The Conference Board forecasts are provided in Exhibit C-3, and show a growth of approixmately 2% to 3% per annum for Canada to 1988. The Atlantic provinces generally exhibit very modest growth with a strong upswing at the end of the decade. Quebec shows fluctuating growth with a strong surge in 1988-89. Generally, the overall picture is of modest to good growth in all eastern provinces.

EXHIBIT C-3: FORECAST GDP OF CONSTRUCTION INDUSTRY ($MILLION 1971) AND PERCENT CHANGE FROM PREVIOUS YEAR

	1984	1985	1986	1987	1988	1989
Canada	6474	6596	6760	6896	7093	7424
	-2.0	1.9	2.5	2.0	2.9	4.7
Newfoundland	116	115	120	123	125	130
	-5.0	-0.1	3.5	2.9	1.4	4.4
Prince Edward Island	22	23	23	22	23	24
	-1.1	3.7	0.8	0.0	0.0	4.9
Nova Scotia	240	205	206	207	209	216
	2.2	0.3	0.9	0.5	1.1	3.6
New Brunswick	166	169	172	173	178	187
	1.3	1.7	1.6	1.1	2.7	4.7
Quebec	1330	1345	1396	1435	1491	1578
	2.6	1.1	3.8	2.8	4.0	5.8

Source: AERIC Provincial Forecast, Conference Board of Canada, January 30, 1985

These estimates may be optimistic in light of the construction sector's difficulties over the past recent years. Also, these forecasts were developed in recognition of positive developments with respect to exploration, development and production of east coast offshore oil and gas. With the recent significant decline in world oil prices (about $15.00 per barrel at the time of writing) and predictions by many analysts that prices will remain low into the mid-nineties, offshore production may not occur until the end of the century. Indeed, substantial layoffs in these industries have begun in Newfoundland and Nova Scotia. Thus, the GDP forecasts will probably be modified downwards in future projections.

The Informetrica forecasts are provided in Exhibit C-4. These estimates are expressed as average annual percentage changes for the 1986-1990 and 1991-2005 periods for various indicators by province. Newfoundland is expected to lead the country in both GDP and labour force growth over the 1986-1990 period. (This growth is almost entirely predicated upon development of Hibernia). All provinces exhibit real GDP growth greater than the national average of 2.2% except for Ontario and British Columbia/Territories. Over the 1991-2005 period, Alberta and Newfoundland are expected to lead the country in real GDP growth with annual average rates of 3.3% and 2.9% respectively. (Again, these rates are based upon favourable energy-related investments). The slowest growing provinces are expected to be New Brunswick, Nova Scotia and Prince Edward Island.

There are many significant unknown factors that will influence these forecasts, not the least of which are international oil prices and the future of free trade. The results of free trade negotiations, currently in preliminary stages, will likely play a major role in future growth. The effects of free trade are heatedly debated, but some analysts are of the opinion that resource rich provinces will benefit and industrialized/manufacturing centres will suffer. This scenario will likely provide optimistic growth for the Atlantic provinces

which enjoy both resource abundance and proximity to major notheastern markets.

EXHIBIT C-4: FORECASTS, VARIOUS ECONOMIC INDICATORS

AVERAGE ANNUAL PERCENTAGE CHANGE 1986-1990

	Gross Domestic Product $1971	Total Employment 000	Labour Force 000	Total Unemployment 000
Newfoundland	5.1	3.8	2.5	-5.3
P.E.I.	2.5	1.5	2.1	6.4
Nova Scotia	2.5	1.7	2.2	6.1
New Brunswick	2.3	1.5	1.4	-2.2
Quebec	2.2	1.5	1.4	0.4
Ontario	2.0	1.3	1.4	1.8
Manitoba	2.8	2.0	2.0	1.9
Saskatchewan	2.6	1.5	1.5	1.0
Alberta	2.3	1.4	1.5	2.4
B.C. & Terr.	2.0	1.3	1.2	0.4
Canada	2.2	1.5	1.4	1.2

AVERAGE ANNUAL PERCENTAGE CHANGE 1991-2005

	Gross Domestic Product $1971	Total Employment 000	Labour Force 000	Total Unemployment 000
Newfoundland	2.9	1.7	1.5	-0.7
P.E.I.	1.7	0.9	0.6	-1.7
Nova Scotia	1.5	0.8	0.6	-2.3
New Brunswick	2.3	1.3	1.1	-1.2
Quebec	2.4	1.4	1.1	-2.1
Ontario	2.8	1.6	1.1	-8.1
Manitoba	2.4	1.4	1.0	-6.0
Saskatchewan	2.4	1.3	1.2	-0.5
Alberta	3.3	2.1	1.9	-0.2
B.C. & Terr.	2.5	1.5	1.0	-3.8
Canada	2.6	1.5	1.1	-3.6

Source: Informetrica Ltd.

Commercial Office Building Activity

The report indicates that one of the primary markets for stone exterior cladding is commercial office buildings. Office space demand is usually measured by at least three indicators.

- The "vacancy rate" relates the amount of vacant space expressed as a percentage of the total amount of available space.

- The "absorption rate" is the amount of new space (expressed as floor area) which is required, on an annual basis, to accommodate new business activity.

- "Years of Supply" is a term which relates the above rates and indicates the number of years required to fill available vacant space at the prevailing absorption rate.

In the past, a vacancy rate of approximately 5% was generally accepted to indicate equilibrium in office markets. Recently, however, office space requirements have been changing substantially, primarily due to the dramatic growth of the service sector, but also due to changes in the way office space is used. Hence, the vacancy rate, which is a static measurement describing a situation at a certain point in time, is no longer sufficient to describe the health of the office market. Rather, with larger projects (more unit space injected into the market in sudden spurts) and longer lead times (longer planning and construction periods to obtain new space), the absorption rate, a dynamic measurement, is a more suitable indicator of actual demand.

The absorption rate has been rising dramatically in most major Canadian centres. The Royal Lepage Office Leasing Data Base shows that during 1985, many absorption rates doubled. This phenomena has a profound effect upon stimulating building

activity. For example, in Toronto the absorption rate increased from approximately 3.5 million square feet in early 1985 to in excess of 6.5 million square feet in eary 1986. At the same time, the vacancy rate decreased from about 10% to approximately 8%. This implies that a large amount of new space can be injected into the market. Similar, but less dramatic changes in vacancy and absorption rates have occurred in Regina, Montreal and Ottawa.

In the west, the situation is somewhat different. Calgary serves as an example of a "worst case" scenario. There, the absorption rate decreased from in excess of 5.5 million square feet to approximately 500,000 square feet over the 1982-1984 period. At the same time, the vacancy rate soared from about 4% to about 21%. The absorption rate rebounded to 1 million square feet during 1985 and is projected to continue rising slightly in 1986.

A survey of vacancy rates for commercial office space was undertaken for major centres in Canada. The results are shown in Exhibit C-5 and indicate higher than traditionally acceptable vacancy rates in most areas, especially in the west. In spite of high vacancy rates, the high absorption rates in many cities, particularly in central and eastern Canada, are expected to stimulate substantial building activity.

U.S. Market Outlook

Construction activity in the United States continues to expand in general, with major gains recorded in commercial building, housing and public works. The unadjusted total contract value of all new construction for the first ten months of 1985 was $194.4 billion, up 8% over the same period in 1984.

The overall outlook for the mid term future is one of cautious optimism, with many areas of the U.S. particularly New England, Middle Atlantic and Pacific regions, showing substantial growth in the near term.

However, according to the Construction Industry Forecast prepared by CIT Corporation the outlook is tempered by a number of variables which are difficult to measure, including proposed tax reforms, escalating insurance costs and lack of sufficient bonding services for contractors.

The national office vacancy index compiled by Coldwell Banker has risen steadily since 1981. The downtown index has risen from approximately 5% in 1981 to an historic high of 16.5% in September 1985. The suburban index has also climbed to a record high of 21.2% as of the same period. The increase in the downtown index results primarily from completion of large amounts of new space in smaller markets.

However, absorption rates remained healthy in most downtown areas. This measure is the more important indicator of likely building activity. The increasingly higher absorption rates indicate that office space markets will continue to grow. The vacancy rate and absorption rate for major U.S. centres is shown at Exhibit C-5.

EXHIBIT C-5: OFFICE SPACE VACANCY RATES, UNITED STATES (CLASS A SPACE)

City	Vacancy Rate D	S	Absorption (Million SF)
Baltimore	10.8	8.3	1.2
Boston	11.1	13.5	6.0
Manhatten	6.6	8.3	4.0
Philadelphia	8.5	17.5	1.7
Washington, D.C.	7.4	9.5	11.9
Atlanta	17.9	19.3	4.1
Miami	22.3	25.8	1.3
Chicago	15.6	20.3	5.8
Dallas	25.7	26.8	7.8
Houston	16.8	23.9	5.3
Los Angeles	8.0	14.3	6.6

Source: Buildings, Volume 80, No. 1, January 1986
D = Downtown
S = Suburb

APPENDIX D

MONUMENTAL STONE MARKET SURVEY

DPA undertook a survey of monumental stone dealers and distributors in Atlantic Canada and Quebec. The questionnaire is attached; the analysis follows.

1. Types of Monuments Produced

Memorial: upright, slanted and flat markers.

Generally commemorative monuments and those to mark historic sites can be produced on request. Examples include the Fredericton Loyalist monument, Nova Scotia Government House, and other cornerstones.

Other uses, mentioned by Nelson, was curbing.

2a. Origin of Rough Stone

In Newfoundland most of the rough stone is granite and comes from Beebe, Quebec. Canadian granite is also suplied from Ontario and Manitoba. Imported granites are Indian Red, African Coral Black, Mt. Rose and Blue.

Many of the Newfoundland Monumental stone dealers are named "Marble Works", since before granite became popular marble was the main monumental stone. Today imported marble comes from Alabama, U.S. and Italy. Marble is approximately 30% cheaper than granite but does not weather as well.

2b. Average Price Paid

Many dealers in the monumental stone market were reluctant to declare prices paid for stone.

Average prices for rough block were indicated as follows:

FOB Quebec
$30 - $35/cu ft. Quebec granite
$45/cu ft. U.S. granite
$45/cu ft. South African granite

FOB New Brunswick
$5 - $20/cu ft. Quebec granite
$17 - $20/cu ft. Imported granite

FOB Nova Scotia
$60/cu ft. Indian Red and South African Black
$10-20/cu ft. Rough stone Canadian granites

Nova Scotian dealers reported that Canadian rough granite was obtained from Quebec, Manitoba, Nova Scotia, (Heritage Memorials Ltd.), Newfoundland (McLeod's Monument Works Ltd.) and Ontario.

U.S. granite came from Vermont, (Somerset Grey, Mt. Rose) and New Hampshire.

Offshore imports were South Africa, (Brits Black, Premium Black, Sunset Black, Belfast Black, Blue), Zimbabwe, India (Oriental Red), Finland, Sweden and Denmark.

New Brunswick dealers stated that Canadian granite came from New Brunswick (reported Nelson Monuments Ltd.), Ontario (Vermillian Bay), Quebec (Beebe, Lac St. Jean).

A Quebec stone dealer used Quebec and U.S. granite together with imports from South Africa (Black and Charcoal grey), and Italy.

2c. Transportation Costs

Most monumental stone dealers reported that transportation costs were in proportion to distance that had to be travelled. It was generally indicated that local stone was cheapest.

One Nova Scotia dealer stated that overland freight was more expensive than ocean going. It was also stated that it was as cheap to ship from South Africa as from Quebec.

A Cape Breton, Nova Scotia dealer said that rail was cheaper than road for internal transportation. Trucking from Montreal to Cape Breton was quoted as being $5/cwt. Stone shipped through the port of Halifax was required to be of minimum order 1000 tons.

A Newfoundland dealer stated that transportation costs for stone shipped by boat from India or Africa were cheaper than for Canadian granite shipped by rail or truck. Another Newfoundland dealer quoted transportation costs of $8 - $12/cwt from Beebe (Quebec), 70 miles to Montreal then by boat to St. John's.

Generally Newfoundland dealers found transportation costs high, but that they become proportionally cheaper with larger shipments.

A Quebec dealer quoted a transportation cost of $2/cu.ft.

3a. Where product is sold

Product sales were generally greatest in the province of origin of the stone dealer, especially in the vicinity of actual location.

A small proportion of sales are interprovincial within the Atlantic region.

3b. Colour and type of stone that is most popular

One Nova Scotia dealer indicated that a typical upright marker consisted of approximately 2 cu ft of stone in the base and 3 cu ft in the headstone.

Since little of the base is visible a cheaper grade of granite may be used. Grey granite is usually chosen and accounts for 65 - 70% of the total sales and 95% of the base material.

Black is usually the preferred colour for the headstone (60%), followed by Grey (35%), and Red (5%). Many dealers indicated that black headstones are chosen by as high as 80% of clients.

A Nova Scotia dealer stated that many customers were determined to have the black South African granite, and that it was difficult to sell them other products.

Another Nova Scotia dealer in Cape Breton mentioned that although black had been the most popular colour in previous years, grey had been in more demand this year.

Two New Brunswick dealers stated that although black was the traditional favourite colour, light grey,. rose and pink were becoming more popular.

A Newfoundland dealer was of the opinion that colour was not as important as price.

Another Newfoundland dealer mentioned that black South African and dark red Indian granite were the easiest stones to work and gave excellent contrast.

4a. Volume of production change in last five years

Of the dealers that responded to this question, the results were:

Growth	56%
Same	18%
Decline	11%
N/A (i.e. not open 5 years)	15%
	100%

By Province:

	Newfoundland	New Brunswick	Nova Scotia	Quebec*
Growth	50%	56%	69%	100%
Same		11%	15%	
Decline		22%	8%	
N/A	50%	11%	8%	

* only one dealer contacted in Quebec.

4b. Reasons for changes in production

Increases

- customer confidence
- better marketing
- salesmanship
- quality and service
- more people per capita are dying
- reputation
- opening of a new quarry
- hard work
- referrals from satisfied customers

Declines

- competition from funeral homes
- many people are buying memorials in advance (Pre-need)
- declining Newfoundland population.

5a. Expected volume of production change in next five years.

Most stone dealers were fairly optimistic regarding production over the next five years and generally expected growth or at least stability in the market.

5b. Reasons for expected growth were generally the same as for the previous five years.

Additional reasons were:

- growth in urban populations
- growth for other uses, e.g. construction
- methods of manufacturing changing, e.g. diamonds saws and polishing machines

- some people erect new monuments on old graves when they have more money.

6. Volume/Value of production in 1985

Most dealers considered this information to be confidential. Only four dealers spread over three provinces were willing to divulge sales value and volumes. Thus, meaningful aggregated data cannot be developed.

7a. Promotion of Product

Monumental stone dealers use varied techniques to advertise and promote their product. Of the dealers contacted the following table indicates the methods of promotion used by percent:

Type of promotion	% of Respondents
Flyers/Brochures	45%
Advertise in print media	75%
Yellow pages	100%
Showroom	78%
Word of Mouth	82%
Door to door calls	3%
TV/Radio	7%
Donations to sports	7%
Telephone	28%

Types of print media used were:
- daily/weekly newspapers
- church magazines and periodicals
- senior citizens magazines.

7b. Most successful methods of promotion

Promotion by word of mouth was indicated as being by far the most successful method of promotion.

8 General comments about the future of the monumental stone industry

72% of the dealers surveyed felt that the future looked good for the monumental stone industry.

28% were more pessimistic regarding the stone industry's future.

Reasons for this were:

- growth of memorial gardens in urban areas (these gardens do not allow upright markers, they only permit flat stones or bronze markers set flush with the ground)
- space limitations in established cemeteries

Other comments regarding the stone industry in Canada:

- Black granite is the most popular headstone material yet it is mostly imported from South Africa, since no good quality black granite exists at present in Canada. (where to find a good black stone if sanctions imposed on South Africa?)
- growth in other areas is essential for the granite industry. Granite is less expensive than some other construction materials and prices have remained stable over the last 10 - 15 years.
- better communications should be established between the quarries and the monument suppliers. Excessive mark-up is gleaned by middle-men
- healthy competition between monumental stone dealers is excellent for business and customers get a better product at a better price.

MONUMENTAL STONE MARKET QUESTIONNAIRE

Ask for Manager.

Hello, my name is _____and I represent the DPA Group Inc. We are doing a study of the stone industry in Canada, specifically, evaluating the future market potential for dimension stone and monument stone. I would appreciate a few moments of your time to answer a few questions.

ESTABLISHMENT: _____

ADDRESS: _____

_____

TELEPHONE: _____

CONTACT PERSON: _____

DATE: _____

******

1. What types of monuments do you produce?
   - Memorial _____
   - Commemorative _____
   - Historic sites, etc. _____
   - Other _____

2a) Where do you obtain your rough stone?

Atlantic Provinces:
- NS _____
- NB _____
- NFLD _____

Quebec _____

Ontario _____

Rest of Canada _____

U.S. _____

Offshore _____ - specify countries

b) What are the average prices paid? (cost/volume or weight)

c) What proportion of the cost is attributable to transport? What mode (rail, truck, boat) of transport is used?

3a) Where do you sell your product? (obtain percentage breakdown if possible)

Home Province _____
Other Provinces _____ (Specify)
United States _____
Offshore _____

b) What colour and type of stone appears to be the most popular?

4a) Has your volume of production changed in the last five years? (up to end 1985)

Grown _____
Remained the same _____
Declined _____

b) Probe reasons for above and extent:

5a) Do you expect your volume of production to change in the next five years?

Grow _____
Remain the same _____
Decline _____

b) Probe reasons for above and extent:

6. What was your volume/value of production in 1985?
   Volume _____ (Tons, cuft, etc.)
   Value _____

7a) How do you promote your product?
   Flyers _____
   Advertize in
   print media _____ (Specify)
   Yellow pages _____
   Showroom _____
   Word of Mouth _____
   Other _____

b) Which means (above) appear to be the most successful?

8. Do you have any general comments about the future of the monumental stone industry?

THANK-YOU